STATUS AND THE “LOWER” CLASS: A BIO-CULTURAL EXAMINATION OF THE NON-ELITE CLASSIC MAYA SUBURB COMMUNITY OF GUERRA, BUENAVIDA DEL CAYO, IN THE WESTERN BELIZE VALLEY

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For My Family

and

The Ancestors
As those who study them have come to learn, bones make good witnesses- although they speak softly, they never lie and they never forget.

-Clyde Snow
The non-elite segment of the ancient Maya civilization has long been considered a homogenous social stratum. However, recent studies have begun to reveal the true, complicated, and hierarchical organization found within the non-elite social group. This thesis takes a bio-cultural perspective on skeletal and archaeological material of the 23 non-elite Maya individuals recovered from Guerra, Belize. Four residential structures within Guerra, Gypsy, Tatu, Dart, and Sara, were excavated as part of the San Diego State University Mopan-Macal Triangle Archaeological Project (MMTAP). The goal of the project is to gain a comprehensive understanding of Maya social structure and daily life, therefore, excavation of both large urban centers and small, rural Maya communities was undertaken. Guerra is the small rural suburb community located outside the urban site of Benavista del Cayo in the western Belize Valley. The site was occupation throughout the Classic period (AD 200-900). An analysis of the mortuary practices, and skeletal indicators of health and genetic markers reveals the complicated, hierarchical organization of this non-elite community and its relationship to the residents of the adjacent urban center. Differences in burial practices and architectural types indicate Guerra was a ranked community throughout its occupation. Overall the health of this community is good for both high and low status non-elite individuals. Dental pathology indicates there was a greater divide in access to resources between high and low status non-elites during the Early Classic than the Late Classic. A high frequency of childhood stressors is found in Guerra. Compared to the low frequency of childhood stressors found within the high status elites and sub-elites of Buenavista reveals the impact was greater for the non-elites than elites. This conveys that within the western Belize Valley there was social inequality when it came to access to certain resources. Statistical analyses of dental morphology and metrics show Guerra shares more biological affinity within the community than to the high status sub-elites of Archangel-Angel residing in Buenavista. However, results indicate these two communities do share distant affinity, probably through marriage. A fictive kinship tie between Guerra and the ruling elites of Buenavista-Cahal Pech is highly probable based on the presence of identical caches at both sites. The current evidence suggests Maya community structure, organization, and membership was based primarily on biological affinity.
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CHAPTER 1

INTRODUCTION

Ancient Maya civilization has intrigued researchers from around the world since the time of first European contact. Archaeologists, linguists, ethnographers, and bioarchaeologists, among others, have contributed to our current understanding of who the ancient Maya people were, and what their daily lives were like (see Coe 2005; Demarest 2004; Houston et al. 2002; McAnany 1995; McKillop 2004; Restall 1997; Sharer and Traxler 2006; Vogt 1971; Whittington and Reed 1997a among many others). While attaining a complete understanding of any ancient society is difficult, a multi-disciplinary approach can allow researchers a more comprehensive approximation of past cultures and people. This thesis will focus on the human burials recovered at one Classic period suburban village settlement in the upper Belize Valley of the eastern Maya lowlands, and the information that can be obtained through bio-cultural analysis.

Between 1981 and 1989 the San Diego State University Mopan-Macal Triangle Archaeological Project (MMTAP), directed by Drs. Joseph W. Ball and Jennifer Taschek excavated the urban centers of Cahal Pech and Buenavista del Cayo and the rural suburb community of Guerra. The objective was to gain a comprehensive understanding of Maya social construct and daily life in large and small centers. Drawing primarily on the skeletal biology and supported by archaeology and cultural analysis, a picture of ancient Maya commoner lives of rural Guerra, located just outside Buenavista del Cayo, will be developed here.

The study of human skeletal remains has been an integral part of the sub-discipline of Biological Anthropology for most of its history. In the late 20th century, American anthropologists adopted the term bioarchaeology and defined it as the multi-disciplinary approach to the study of health and disease, diet, population demographics, and population movement through analysis of archaeological human skeletal remains (Buikstra and Beck 2006; Larsen 1997). Human remains give researchers access to indispensable information
about the “who” an individual was in life and, if correctly applied, additional knowledge about their status, occupation, heredity, and overall health (Parker Pearson 1999).

Status differentiation and hierarchy are important components in the organization of human societies. Some researchers go as far as to say status is a fundamental aspect of behavioral dynamics in all human societies (Thomas and Robins 1985). Status is a position of privilege in which there is an unequal balance of power and access to important, basic resources that sustain life, the most important being food (Parker Pearson 1999). Such access aids greatly in the ability to overcome sickness, infection or other outside influences on health both as a child and an adult. Individuals without access to important resources may not have the opportunity to overcome these same influences. Differential access in a society also means different daily lifestyles, including divergent occupational roles. Although adept at withstanding stressors placed on it, the skeleton responds to habitual activity by visibly changing muscle attachments or joints to accommodate the activity (Larsen 1997).

Dentition is a unique source of information pertaining to an individual’s life history. The occurrence and placement of caries, abscesses, antemortem tooth loss, calculus build-up, and attrition (dental wear) can reveal both dietary and occupational activities. Linear enamel hypoplasias (LEH) bear witness to childhood stress episodes and childhood health. Hereditary non-metric traits such as tooth morphology, including shovel shaped tooth, Carabelli’s trait, and cusp number, as well as dental metrics allow for a determination of biological affinity between and within communities. With this understanding, skeletal analysis provides the bioarchaeologist a unique window into both the biology and social behavior of a group of people.

With this in mind, the following questions are the focus of this thesis. Archaeological evidence in the area suggests violent conflicts may have been a regular occurrence. Normally, elite individuals fulfilled the role of warrior, but it is possible the lower class individuals may have been involved as well. To what degree was violent conflict a part of Guerra life as reflected by traumatic lesions?

Maize agriculture was a large part of Maya life by the Late Classic period. This life style not only brought on hard labor activities, but also made individuals susceptible to poor oral health and infection. However, not everyone in the community may be affected to the same degree. Socioeconomic status plays a major role in access to food resources as well as
the types of occupational activities being undertaken by certain social classes. The
Mopan-Macal River Triangle is clearly a ranked society, therefore, is the population status
reflected in the oral health of the non-elite human remains of Guerra compared to the
sub-elite remains of Archangel and Angel, and royal elites of Buenavista-Cahal Pech? Is the
population status reflected in the occupational stress markers found on these individuals?

Adult health is greatly affected by stressors experienced during the early years of life.
Indicators of childhood stressors, such as linear enamel hypoplasias and porotic hyperostosis,
also may have negative effects on adult health and survivability. Individuals of non-elite
status should also show a differential distribution of these childhood stressors due to lack of
access to the resources which are available to elites. To what degree is there childhood stress
in the individuals of Guerra? How does it compare to the childhood stress of the sub-elite and
elite populations in the area?

Although of high status and in close proximity to the royal elites previous studies
(Black 2007; Mitchell 2006) indicate that the sub-elite individuals of Buenavista’s Angel and
Archangel sites are not biologically related to the Buenavista-Cahal Pech royal elite family.
This lack of biological affinity suggests that individuals from Angel and Archangel achieved
their higher status positions. In addition, Buenavista functioned largely as a public center and
catered to the rural community of Guerra. Therefore, the question is, are individuals from
Guerra biologically related to the individuals from Angel and Archangel?
CHAPTER 2

MAYA HISTORY AND STATUS

MAYA HISTORY

Ancient Maya civilization flourished between roughly 400 BC and AD 1697, succumbing finally to European conquest in a final bloody slaughter at Nojpeten, Guatemala on March 13th of that year (Jones 1998; Sharer and Traxler 2006). Mayanists divide this broad span into three major temporal divisions. The first of these periods is the Preclassic, actually extending from 1500 BC, or earlier, to AD 200. The second is the full Classic stretching from AD 200 to 900; and the third is the lengthy and complex Postclassic era of AD 900 to 1697 (Coe 2005; Demarest 2004; Fash 1994; Jones 1998; Sharer and Traxler 2006). It is during the Postclassic that contact with Europeans first took place. Each of these periods is divided into still finer segments that will be addressed during the course of this thesis.

Occupying an area of approximately 325,000 square kilometers, the ancient Maya lived in what is now southern Mexico and northern Central America, or Guatemala, Belize, and a small portion of Honduras (Coe 2005; Demarest 2004; McKillop 2004; Sharer and Traxler 2006). This geographic distribution encompasses landscapes ranging from tropical lowlands in the central and eastern regions to volcanic highlands in the west. The lowlands make up a much greater space than the highlands and include the large political centers of Tikal, Calakmul, and Copan, among many others (Sharer and Traxler 2006). Trade was an important aspect of ancient Maya life and because of this, movement throughout the region and up and down the coasts took place regularly (Hammond 1991; Scherer 2007). The extent of trade and the amount of importance placed on the traded goods can be seen in the grave goods associated with burials (Chase 1997). Trade establishes linkages among regional groups but does not signify completely peaceful relationships. Violent conflict was a common phenomenon especially with the rapid population expansion and growing social complexity of the 6th through 9th Centuries (Scherer 2007).
Status Organization

By the middle of the Classic period, the ancient Maya were an established agricultural civilization cultivating maize, beans, and squash. Depending on geographic location, various other resources were consumed, such as marine life and small game animals (Webster 1997; White et al. 1993). The degree of dependence on maize among the Maya was regionally and temporally variable, however, maize is determined to have been a universal food base (Saul and Saul 1997; Scherer et al. 2007; Webster 1997). Because of this, many ancient Maya skeletal samples exhibit caries (cavities), calculus buildup (tartar or plaque buildup, most commonly seen along the cemento-enamel junction of the tooth (Cucina and Tiesler 2003a), and antemortem tooth loss which is a usual occurrence in agricultural populations (Massey and Steele 1997; Mayes 2001, 2007).

Regional variation becomes apparent when comparing locales such as Belize, where marine resources are readily available because of its proximity to and distribution along the coast, and landlocked sites such as Copan, with a greater reliance upon agriculture (Webster 1997; White et al. 1993). Many Maya sites were abandoned during the Late Classic period which may have resulted from an insufficient food production rate to population growth (Yeager and Robin 2004). High rates of malnutrition found in many skeletal populations from this time period may have carried over to modern populations who suffer from similar problems (Marquez and Angel 1997).

The highly stratified society of the ancient Maya included ascribed status—an individual born into their social position—and to a lesser degree, achieved status, when an individual gains their status position through life achievements (Haviland 1966). Some genetic movement from lower status populations to higher status ones through marriage have also been postulated by Webster (1997) and actual evidence of such was found by Scherer (2007). The location of burials is a highly significant status indicator among the ancient Maya since most individuals were buried in or around their residential dwellings (Webster 1997). Over the Late Classic (AD 600-900), the Maya produced enormous numbers of hieroglyphic texts which have survived to the present and add valuable information about the cultural ideology of the civilization (Bricker 1983, 1995, 1999, 2007). In addition, specific hieroglyphs provide names, titles, types of offices, life histories, and absolute dates of
specific elite rulers and their families which have been matched to osteological remains (Webster 1997).

**Advantages of Status**

Status is generally considered to be a prestigious position and with it comes certain advantages. For example, material wealth is not a necessity for status, but many times is found in conjunction with higher status. Honor or respect can also include an individual in a higher status role, in the instances of priests or spiritual guides. Theoretically, with any high status position comes better access to resources, the most important being food (Larsen 1997; White et al. 2001). This also includes access to socially valued foods which can set individuals apart through the analysis of oral health (Cucina and Tiesler 2003a) and reconstructing diet through stable isotope analysis (White et al. 1993; Whittington and Reed 1997b). In the case of the Maya, this includes maize. More contemporary studies are employing osteological evidence such as dental pathology and isotope analysis to bring a new perspective to studies on status (Chase 1997; Cucina and Tiesler 2008; Saul and Saul 1997; White 1997; White et al. 1993; Whittington and Reed 1997b). Because of greater access to food items, certain elite groups have been found to have a taller stature than lower status individuals (Larsen 1997). Access to better food also allows these individuals the ability to overcome certain environmental stressors which might adversely effect the general populous to a greater extent (Mayes and Barber 2008). Within the elite and non-elite strata, there can even exist differential access to resources on the basis of sex. Generally, males are the individuals who gain preference over females for access to basic resources as well as the control of wealth (Gillespie 2000a; White et al. 1993). Cucina and Tiesler (2003a) argue that this divide usually occurs within the elite groups and is not detected as frequently in the non-elite stratum. This could be explained with the argument that lower status individuals shared similar life styles because they could not afford, either physically or monetarily, to do otherwise (Whittington and Reed 1997b). However, evidence from dental modification suggests that during the Late Classic there was more equal access to power between males and females in some Maya communities (Williams and White 2006)

Achieved status can occur in these stratified societies, but sociologists consider achieved status to be more prevalent in contemporary societies than in past societies (Parker
Pearson 1999). As it sounds, achieved status is gained through life achievements, such as education or personal advancement in wealth (Parker Pearson 1999). A study by Haviland (1966) utilized both ethnographic and archaeological data to suggest that political positions for non-elite Maya could have been on a rotational schedule of every one or two years whereby individuals were able to enjoy certain amenities otherwise unavailable to them during this period; further ethnographic evidence from Vogt (1969) corroborates this. Marcus (2004) also gives evidence for non-elite individuals who were able to gain enough wealth to allow their homes and burials to be of greater elaboration than the bulk of commoners.

Many Maya status studies focus on the dynamic between the highest elite status and the lowest non-elite status groups, but individuals who make up the middle rungs of society are also an important group to consider because they often constitute the greatest portion of the population (Mayes and Barber 2008). More recently, Maya studies have begun to include analysis of the middle class commoner segment which gives a more complete picture of this ancient society (Lohse and Valdez 2004a; Taschek and Ball 1986). There are, however, differing arguments with regards to the existence of a Maya middle class. Ethnohistorical documentation (Roys 1943 from D. Chase 1992:121) includes the term *azmen uninic* which translates to “middle” or “medium men.” A. Chase (1992) argues that difference in tomb volume at Caracol, Belize gives evidence for the presence of a middle class. Marcus (1992, 2004), however, reasons that there is no Maya middle class in the sense of a self-contained economic social unit. Around the contact period, the Spaniard recorded the term *açmen winik* which translates to “a man between principal [noble] and plebeian, a man of middling status” (Martínez Hernández 1929:69 in Marcus 2004:261). Marcus (2004) argues the explanation is more likely a commoner who elevated their wealth and status through achievement, or been appointed a political office. Though these individuals would never be able to acquire noble status, their homes and burials would appear intermediate to commoners and elites. The individuals examined in this thesis are from a contextually lower class. Through the comparison of their remains and those of the royal elites and sub-elites in the region the goal is to gain a more complete picture of Maya elites and non-elites.
MAYA SOCIAL ORGANIZATION

Maya studies have a long history of unequal focus on elite individuals. Elites undoubtedly had a great influence on the shaping of history, but considering that non-elites are estimated to have encompassed 80-90% of the Pre-Columbian population (Lohse and Valdez 2004b; Marcus 2004), it is not hard to image they had an impact on history as well; if perhaps in a less obvious or indirect way. Indeed, it is recognized by all scholars that non-elites were essential to the construction of large public works, the maintenance of diverse agricultural strategies, the movement and trade of goods between sites, specialized craft production, and to the creation of a thriving Maya economy (Marcus 2004:255).

Inomata (2004:176) argues this study bias towards elites is not necessarily due to a shortage of interest in non-elite individuals, but rather “the diversity in the social reality of Maya commoners and the complexity of the theoretical problems involved.” Since non-elite groups started becoming a prime focus of archaeological studies in the 1950s, scholars have discovered just how extended and convoluted the continuum from lowly commoner to wealthy non-elite really is (Lohse and Valdez 2004b). Recent studies have focused on structure function in particular to better understanding the complicated nature of this population segment (Gonlin 2004). Though the base knowledge of non-elites is growing rapidly, there is still much to be learned about this social group.

A “commoner” simply put is anyone of non-elite status who is not of noble birth. As Marcus (2004:277) points out, this “includes everyone from impoverished subsistence farmers to wealthy craftsmen, or even trusted commoners appointed to bureaucratic offices by nobles.” For this reason, non-elite and commoner will be used interchangeably in this thesis. In colonial Yucatán Maya society was partitioned into almehenob (nobility) and mazehualob (commoners; Dunning 2004:97); though this dichotomy discredits the complex reality wherein there were subclasses of both commoners and nobility. The dividing line between the upper and lower echelon of both groups was somewhat more blurred in practice and can be quite difficult to discern in the archaeological record (Dunning 2004; Lohse and Valdez 2004b; Marcus 2004; Masson and Lope 2004).
ADDRESSING STEREOTYPES

There are four pedestrian stereotypes held about non-elites that need to be addressed here; their homogeneity, their pacificity toward elite control, the static nature of their behavior, and the amount of household uniformity (Marcus 2004). The first: commoners are regarded as a homologous group, has been a widely held misconception for decades. It is now known that non-elites were responsible for the dietary requirements of themselves and the elites, as well as being full-time specialized craft producers (Lohse and Valdez 2004b). Craft production not only means differing equipment accumulation by different households, but also a separation in wealth accumulation (Marcus 2004). The variety of craft production occupations includes masons, potters, mat makers, weavers, traders, hunters, fishers, beekeepers, dyers, sandal makers, and so on (Marcus 2004:265). The assumption that all Maya non-elites were homologous means that the house of a farmer would be identical to that of a crafts person (Marcus 2004). Expressions of social organization in non-elite communities is also variable from site to site. Yeager and Robin (2004) give evidence for two locals only 4 km apart which were heterogeneous in social organization, ritual observation, and subsistence practices.

The second stereotype is that non-elites were passive recipients of elite directions. Access to and control over resources is at the crux of this stereotype. In hierarchical societies there is an unequal access to resources. However, McAnany (1995) argues that this inequality of resources is quite unstable and more easily reshaped compared to the class-based social inequality between Maya elites and non-elites. Two competing theoretical paradigms have arisen to better understand the relationship between these groups; (1) independent decision making was in the hands of non-elite farmsteads, or households; (2) a centralized control of resources and production was held by elites (Lohse 2004). With the first paradigm, scholars contend individual commoner houses are the most important element in understanding Maya economy. This theory is deeply rooted in Mesoamerican studies through household archaeology and is supported by ethnographic evidence (Lohse 2004). In contrast, for the second paradigm scholars argue that elite control of household labor is the most informative economic element (Marcus 2004). Lohse (2004) argues for a combination of both paradigms because each are limited in scope and it is quite possible there was independence on a daily level as well as overall control of some aspects of
production. Yeager and Robin (2004) as well as Inomata (2004) give evidence for a complex, multidimensional relationship between commoners and elites: wherein commoners react to elite political and economic influence as well as elites reacting to commoner political and economic influence. Ecologically and topographically speaking, the lowland region is diverse. Given their location outside the urban center it is very likely that non-elites were at the helm of developing and adapting cultivation techniques and agricultural systems appropriate for their region. They would need to be innovative and adapt to their unique ecological surroundings in order to meet the food demands of the community (Lohse and Valdez 2004b; Marcus 2004). If this was the case, non-elites had at least some input in aspects of the economy and were not completely passive recipients of elite directives.

The third stereotype is commoner behavior and practice was largely static. Marcus (2004:263) argues that a look at the utilitarian artifacts coming out of non-elite houses (manos, metates, waste flakes, and storage jars) may give the appearance of behaviors unchanged over centuries, but in fact this is misleading. Some behaviors did not change much, for example the use of manos and metates for grinding corn, but Marcus (2004) argues the production of the corn after the initial processing did change and added new technologies to the community. The evolution of equipment in the highland and lowland regions is different both in the types of equipment found and when certain production items show up in the archaeological record (Marcus 2004). A very important element here is the analysis of artifact assemblages is limited to the non-perishable items. Perishable items such as shoes, and clothing which change over time and give insights into cultural and behavioral differences are not available in the archaeological record. Although at first glance it may look as if the behaviors are static, a closer examination reveals how much non-elite behavior and production has changed over time.

The fourth stereotype is that households exhibit a great amount of uniformity. House plots reveal a wealth of information about any group of people. However, Marcus (2004) warns that one house does not stand for them all. She includes the point that even in high-status elite houses there are servants who add low status items to the midden heaps. Ethnographic work on modern indigenous households has revealed the general uniformity of household items and activities (Sandstrom 1991 in Marcus 2004). However, it is important to note that these modern households are a part of the monetary economy now in place and no
longer adhere to the lineage based class system of noble and commoner (Marcus 2004). As previously stated, the variety of craft occupations and agricultural positions inevitably contribute to the variety of activities occurring within non-elite household and the differences in the makeup of midden deposits (Marcus 2004). Adding to this, Lohse and Valdez (2004b) suggest the variation in the architecture itself expressed outside the urban centers is also an important element in understanding the many gradations of social strata within the non-elite group.

**NON-ELITE SOCIAL MODELS**

A majority of older models put forth concerning non-elite social organization based their information heavily on the comparison to elite groups. The assumptions here are that there are only two social groups, elites and non-elites, and completely overlook any possibility for social gradations between strata. It also assumes that both social groups are homologous within themselves which, as has been previously discussed, is not the case for non-elites. In recent years there has been a shift in theoretical perspectives that focus on understanding non-elites in their own right on a finer scale, as well as within the context of the larger social network. Multiple new models have been presented for understanding non-elite Maya social structure (see Lohse and Valdez 2004a). Archaeological (Marcus 2004) and ethonographic (Vogt 1970, 1976) data support the consensus model of a village settlement wherein either a corporate group, such as Guerra, or micro-communities make up the social organization (Lohse 2004). A main assumption inherent in this model is that most commoners were practicing, or were somehow involved in, the production of food.

**Corporate Group Patterns**

Corporate groups are farming households who have developed into localized coalitions. Lohse (2004:130) lays out five criteria for determining the patterning of a corporate group.

1. Hierarchical ranking of settlement within cluster
2. Light to moderate density of settlement
3. Evidence for hierarchical use of or access to agricultural soils
4. First Tier groups reflect “special purpose” role
5. Cluster occupies poor to moderate agricultural zone
The First Tier group in this pattern is larger and contains more elaborate architectural and functional evidence than the remaining structures with few borders designating each familial plot from the other. For example, a segment of the First Tier structure probably served a communal feasting and ritual purpose (Yeager and Robin 2004). The examples Lohse (2004) gives for the structures of the First Tier group all exhibit east-focused patio groups, much the same as the Gypsy plazuela group in Guerra. First Tier groups were also located nearer the more advantageous agricultural lands which may mean they oversaw most agricultural production. Smaller mounds or ‘box terraces’ (Lohse 2004:131) were found near the residential structures of First Tier groups. These terraces were determined to be seedbeds; given their location, members of the group most likely assumed control over plant choice. This would also have permitted group members to control the growth, development, and distribution of crops (Lohse 2004). The ‘special purpose’ role mentioned above as a criteria may very well have been this involvement in seed dispersal and production. Multiple-family groups based upon lineage ties most likely made up the social organization of the corporate settlement group. In addition to lineage bonds, these people were tied together by the shared agricultural duties they undertook. Throughout the pre-Hispanic (Schele and Freidel 1990), historic (Tozzer 1941), and contemporary periods (McAnany 1995; Vogt 2004), it has been argued that the passing down of land through lineage lines within the corporate groups is a fundamental aspect of Maya social organization. The community Lohse (2004) uses as an example gives evidence for operating autonomously of the larger community, though this may not always be the case. Carmean (1998) and Scherer (2007) suggest that certain domestic groups, such as the First Tier members, may have acted as the local religious and political decision makers and overseers of adjacent residential groups. If this is true, it would give further evidence that elites did not exert direct supervision over groups outside the urban center. However, a form of hierarchical control is still in place with the unequal access to resources and decision-making power by the First Tier group over the rest of the community.

**Micro-Community Pattern**

Lohse (2004:133) describes micro-communities as (1) very densely clustered residential structures which (2) are not easily ranked by size or architectural elaboration. There are a greater number of border walls present between familial structures, indicating the
need to consciously designate between plots. Lohse (2004) interprets these characteristics as a different social organization from the First Tier groups. Arguably, the micro-community portrays a resource-specialized community who has adapted to exploit the small vicinity in which they reside. Their economy is collectively bound to the production within this communal region. Because there is no clear hierarchical delineation and given the small size of the micro-community, Lohse (2004) argues that there is a communal based decision-making structure. Lohse (2004:134) sites Mabry (1996:12) and McCay and Acheson (1987) as reporting on “collective action” resource management and capitalization plans as an alternative to strictly hierarchical decision making processes. These alternatives have yet to be fully established within the Maya region, but with further investigation, may prove to be advantageous models of social structure without centralized or overarching hierarchical control (Lohse 2004).
CHAPTER 3

ARCHAEOLOGY AND SITE HISTORY

Excavation of Guerra was part of the San Diego State University 1981-1989 Mopan-Macal Triangle Archaeological Project (MMTAP) directed by Drs. Joseph W. Ball and Jennifer Taschek. Surveys of the area began in 1981 with excavations continuing for five years between 1984 and 1989 (Ball and Taschek 1991, 2001; Taschek and Ball 1986). The project began with excavations at the household level for the purpose of obtaining a more complete picture of Late Classic Maya community life in the western Belize Valley. Investigations included both large urban centers and small rural communities in order to gain an understanding otherwise unobtainable if the focus were to be placed solely on either type alone (Ball and Taschek, 1991). The project employed four methodological and theoretical elements in order to gain the broad perspective being sought: (1) a full-coverage regional research strategy; (2) focus on a region characterized by comparatively small major centers and lower order sites; (3) an emphasis on the extensive stripping and point-plot recording of multiple complete Late Classic depositional contexts and their contents; and (4) a test model based on the work of urban anthropologist, Richard G. Fox (1977; Ball and Tascheck 1991:149)

Taphonomy is an issue archeologists and bioarchaeologists must confront on a regular basis. According to Nawrocki (1995) taphonomy has the potential to create bias in analysis and differential preservation levels in bone. Taphonomic processes in lowland Mesoamerica are notorious for rendering the preservation of human skeletal remains poor at best, and have significantly affected the condition of the human remains under study for this thesis. At Guerra, poor preservation levels result from a combination of environmental and cultural factors. Environmental factors include an average of more than 80" of annual rainfall and the shallow root systems of tropical forest environments which tend to become entangled with most non-architectural buried remains (Taschek 1984). Cultural factors affecting preservation included milpa (slash-and-burn) agriculture between the Postclassic period and mid-19th century, and deforestation for pasture in the 1960s with the resulting transformation
from forest humus to compact high clay soil (Taschek 1984). In some areas of more ancient soil horizons, preservation was so poor that the bones were not retrievable.

The Mopan-Macal Triangle is located in the upper Belize Valley of central western Belize and includes the major centers of Buenavista del Cayo, Cahal Pech, and Xunantunich (Ball and Tascheck 1991; Taschek and Ball 1986, 2004; Figure 1). Located between Cahal Pech and Xunantunich, Buenavista del Cayo sits just over 400 meters back from the present east bank of the Mopan River and runs along the uppermost terrace at an elevation of 343 feet (104 m; Taschek and Ball 1986). Buenavista is considered to be a small regional center functioning as a place for high-status residence, public ceremonies, and administrative activities (Ball and Tascheck 1991; Taschek and Ball 2004). Beginning around the seventh century, Buenavista became politically and socially tightly interlinked with the neighboring hilltop centers of Cahal Pech and Xunantunich (Ball and Tascheck 1991; Taschek and Ball 2004). Exactly how this connection came about remains undetermined, however, both Buenavista and Cahal Pech exhibit parallel cultural and architectural reconfigurations from this point onward (Taschek and Ball 2004). Archaeological analysis has suggested that hilltop Cahal Pech served as the cool, principal summer dry season residence for the ruling elite, while Buenavista functioned as a warm haven for them during the dank and damp winter rainy season months (Ball and Tascheck 1991). Mitchell (2006) determined that a definitive familial relationship existed between the ruling elite individuals buried at the two sites.

Buenavista itself was the nuclear administrative and economic center for the surrounding area. An acropolis-palace, two ball courts, and at least ten residential courtyard groups make up Buenavista proper (Ball and Kelsay 1992). Of these, two ”middle” status residences, field designated Angel and Archangel, lay immediately southwest of the palace. Although their residents were contextually high status, Black (2007) found no biological relationship between these individuals and the royal elites analyzed by Mitchell (2006). This raises questions as to how these sub-elite individuals obtained their rank, and what segment of the population they originally came from? The latter question is one that this thesis will attempt to address.
GUERRA: PRECLASSIC

Originally labeled a “rural village,” the Guerra settlement immediately adjoining Buenavista to its south has been redefined as a “residential suburb” of the larger, more urban center (Ball and Tascheck 1991; Taschek and Ball 1986; Figure 2). Occupation of the site began around the full Middle Preclassic period (ca. 800–650 B.C.). Though no burials were recovered from this period, and an absence of richness that was abundant in later periods was noted, there was evidence of at least one household partaking in specialized mass manufacturing of small, standardized celt bifaces (Taschek and Ball 1986). Based on extensive amounts of river clam (*Nephronaias ortmanni*) valves and river snail (*Pachychilus indiorum*; *P. glaphyrus*) shells (Taschek and Ball 1986), it can be inferred that at least some of the protein in the diet for individuals during this time was cultivated from the river. Unlike Buenavista that shows occupational continuity into the 6th Century B.C., archaeological evidence of Guerra suggests this site was sparsely populated by small farmsteads and rural hamlets with occupation ending long before 600 B.C. The land may have been interspersedly farmed or exploited for other natural resources, but lay unoccupied until the 5th Century A.D. Whatever the reason for abandonment of Guerra, during that time the northern center of Buenavista was being highly developed (Ball and Tascheck 2004).

GUERRA: TERMINAL CLASSIC

According to Taschek and Ball (1986) Guerra was reestablished with multiple individual households at some point in the 5th Century A.D., growing rapidly throughout the remainder of the 5th and into the 6th Centuries. From here, Guerra flourished into the late 8th Century with a final abandonment sometime in the early 9th Century. A founder household was established, probably early on, which “became increasingly differentiated from other groups in size, configuration, and artifactual inventory” (Taschek and Ball 1986:12).

By the mid eighth century, its residents enjoyed a social position distinct from and more elevated than that of other community members as gauged architecturally, artifactually, and by mortuary patterns. Their household compound-by then comprising a true plazuela group of six platform-based buildings on an elevated patio—very likely functioned as a social nucleus and local ceremonial focus for the Guerra community. (Taschek and Ball 1986:12)

This group may have attained its elevated social distinction through a “founder effect” type scenario which Vogt (1969, 1971, 1976) describes as the initial settlers of the region
becoming the predominant lineage family assumes control of important social and economic aspects of the community. These descriptions suggest the community of Guerra was socially organized into a corporate group pattern during this reoccupation.

A majority of burials and artifacts found at Guerra date to the 8th Century Late Classic period (Taschek and Ball 1986). Difficulty in definitively distinguishing between the two ceramic complexes of the period, Mills and Paloverde, and the mixed nature of many open
secondary refuse deposits and platform histories made the assessment of pin-point occupational and abandonment dates complicated if not impossible (Taschek and Ball 1986; personal communication Joseph Ball 2011). A distinction between sites occupied in the full Late Classic II Mills-Paloverde continuum from those into the Terminal Classic Sacbalam phase (ca. A.D. 820–950/1050) was possible, though there are a small number of sites yielding dates from this later phase (Taschek and Ball 1986:14).

**GUERRA: ABANDONMENT**

Archaeological evidence strongly suggests the abandonment of Guerra occurred somewhere between A.D. 900 and 1050; earlier than other sites in the upper Belize Valley which extended occupation into the late Postclassic and early Colonial era (Taschek and Ball 1986). Pottery sherds found at a riverside patio refuse site indicate there may have been occupation in the region from A.D. 900 to 1200. However, it is more likely Guerra was abandoned during the aforementioned dates and remained thus until deforestation for cattle and sheep pastures in the 1960s (Taschek and Ball 1986).

Not including the settlement’s nuclear plazuela, Guerra is composed of 87 clearly defined mound groups, most of which were discrete homesteads (Taschek and Ball 1986). A plazuela group comprises a free-standing, raised platform with at least four building platforms and building of variable organization residing on it, often including a special-function segment used for sequential, multiple internments of the dead. Using Ashmore’s (1981:51) “group focused patio cluster” as a model the plazuela is “one or more patio groups with a surrounding cluster of other structures and/or groups” in which the surrounding units may be single structures, smaller patio groups, or both. Associated material culture is an indicator of greater access to wealth for individuals residing within the plazuela group than individuals in associated, outlying clusters. A plazuela provides adequate facilities for the housing of no more than a single extended family (Ball and Tascheck 1991:157). Size of individual and group mounds within Guerra varies considerably. Single structure size ranges from 85 to 105 square meters of roofed and/or cobble-floored space. Two to three structural patio groups range in size from 60 to 320 square meters. For these structures, anywhere from 30 to 210 square meters comprised of unroofed floor space (Taschek and Ball 1986). Constituting 77% of the structures found, patio groups make up the
majority of building genre at Guerra (Taschek and Ball 1986). The nuclear plazuela or lineage head’s compound of Guerra, Structure GR-1 (field designated Gypsy), is located near the southern end of the settlement. Beyond the plazuela, all other individuals residing in Guerra are of contextually lower or commoner status, though the burial and architecture of Structure GR-10 (field designated Tatu) are of a middle standing between Structure GR-1 and the other structures. Two additional structures yielded burials (GR-14, Sara, and GR-32, Dart).

**GR-10 (Tatu Group, Parrot Patio)**

Structure GR-10 (field designated Tatu group, Parrot patio) was found with an Early Classic burial dated A.D. 420-500 falling within the Ahcabnal ceramic phase. Burial stratigraphy was clear cut and relatively easy to discern (personal communication, Joseph Ball 2011). This burial (BV84-B9) comprised of two individuals with a possible extra skull. Archaeological evidence suggest Tatu was a “high” or “middle” status family residence because there was a greater amount of energy expended for the construction and maintenance of the structure (personal communication Joseph Ball 2009).

**GR-14 (Sara Group, Granny Patio)**

There was difficulty in dating the burial (BV84-B10) excavated at Structure GR-14-2nd (field designated Sara group, Granny patio) because of complicated surface stratigraphy and floral turbaration. However, a confident date of A.D. 420-500 (associated with the Ahcabnal ceramic phase) within the Early Classic period is assigned to this single internment, lower status burial (personal communication, Joseph Ball 2011).

**GR-32 (Dart Group, Dakri Patio)**

The burial (BV84-B8) in structure GR-32 (field designated Dart group, Dakri patio) containing three individuals, one of them a child, has been difficult to confidently date. Located near the river, Dart was greatly impacted by severe tree fall disturbance which compromised the mound’s integrity and stratigraphy. Ceramic phases dating from the Late Preclassic (100 B.C.) through the Early Postclassic (A.D. 1100) were found in association with seemingly no break in occupation. A conservative date within early Late Classic period
at A.D. 700-780, coinciding with the Mills-Paloverde ceramic phase continuum, is assigned to this contextually lower status burial (personal communication, Joseph Ball 2011).

**GR-1 (Gypsy Group, Chuck Structure/Platform)**

Gypsy is the largest plazuela structure comprised of six structural units, four of which functioned as residential dwellings occupying 2,810 m² of patio or courtyard area circumvented by 360 square meters of roofed space (Taschek and Ball 1986). Based on archaeological evidence, at least two of these residential units were occupied by members of the resident high status family (Taschek and Ball 1986:9). One of the structures functioned as a specialized funerary monument and lineage shrine (field designated Chuck; Figure 3). Eight burials (BV84-B1, B2, B3, B4, B5, B6, B7, and B11) in which sixteen individuals are interred, were recovered from Chuck located at the northeast corner of the compound. Location, material culture, and cultural modification of dentition suggest these burials were a lineage line of higher-status non-elite individuals.

BV84-B1 and BV84-B2 are located in front of the lowest stair riser outside the patio. One of these internments (BV84-B1) is a mass burial dating to the very Late or Terminal Classic (A.D. 780-840: Sacbalam ceramic phase) in which at least seven individuals were interred. This burial holds the latest date at Gypsy. BV84-B2 is a double interment dating to the full Late Classic period (A.D. 740-780: Mills-Paloverde ceramic phase continuum).

At the heart of the platform, BV84-B11 (Structure GR-1-2nd, Feature 1) dates within the full Late Classic at A.D. 720-740 and falls during the local Mills ceramic phase. BV84-B3 and B4 (Structure GR-1-2nd, Feature 3) date to the full Late Classic as well, but may be slightly earlier at A.D. 680 to 720/740; also the Mills ceramic phase (personal communication, Joseph Ball 2011).

BV84-B5, B6, and B7 (GR-1-3rd, Feature 4 and 4B) are the earliest burials in Chuck and are the only three burials which fall in the Middle Classic period. BV84-B5 and B6 (GR-1-3rd, Feature 4) were difficult to date as there was no dateable associated materials. These internments are associated with the late Gadsden ceramic phase (ca A.D. 640-680) and possibly very early Mills (A.D. 670-690). Taking this into account, these burials fall in the Middle Classic, specifically A.D. 680 +/- 20 years (either A.D 660~680 or 680~700). BV84-B7 (GR-1-3rd, Feature 4B) holds the earliest date at Chuck within the Middle Classic.
period at A.D. 580-640 and is one of the few Middle Classic Gadsden ceramic internments. B7 includes two individuals, one of which was a definite lineage leader for the Guerra community (personal communication, Joseph Ball 2011).

An extensive faunal assemblage was excavated from Structure GR-2 (field designated Fatty Fu) within the Gypsy group which probably multi-functioned as a reception hall and banquet premises for the plazuela group and greater community (Taschek and Ball 1986). Although this thesis does not cover the faunal analysis, the presence of this special function structure has important social implications for a hierarchical societal organization at Guerra (Lohse 2004; Yeager and Robin 2004).
CHAPTER 4

MORTUARY PRACTICE AND DEMOGRAPHY

There is a long history of focusing on Mesoamerican elite burial analysis without much consideration for the non-elite dimension even though ritual activity is a powerful medium by which all social groups define themselves and their traditions (Bell 1997:197, emphasis not in original). With this in mind, consideration of non-elite ritual and ideology is becoming a fundamental component of contemporary Maya research (Gonlin and Lohse 2007; Iannone and Connell 2003; Plunket 2002). Mortuary ritual in particular is an integral part of archaeological studies pertaining to ancient peoples because in many cases burials are all that are left behind. Analyzing internments involves the interpretations of cultural and cosmological ideology defined and carried out by the society in which the burial is set (Alekshin et al. 1983; Parker Pearson 1999). Though there are fundamental differences between elite and non-elite internments, similarities in mortuary treatment, artifact assemblage, and ancestral veneration practices signify a shared view of cosmological symbolism independent of social status (Kunen et al. 2002). Recent studies (Grove and Gillespie 2002; Uruñuela and Plunket 2002) have stressed the importance of a multidimensional approach to domestic mortuary interpretation. This includes an analysis of the ritual symbolism, mortuary practices, such as grave location, type, body posture, and associated material culture, as well as demography. Demography is defined as the study of human populations, including their size, composition, distribution and density over time. This thesis discusses demography using skeletal biology. Skeletal biology is the assessment of how and why the human skeleton looks the way it does. Putting together demography and biology is especially important for incorporating the individual into the cultural framework and drawing on broader implications regarding social structure and ritual importance for a community. This chapter will outline Maya cosmology, mortuary practices and discuss in detail the individual burials analyzed for this thesis as they relate to the broader cultural context of the region.
MAYA RITUAL IDEOLOGY AND THE COSMOS

The Maya conceived of their world in four parts as cycles of the sun, moon, and planets, wherein north, south, east, and west do not act directly as cardinal directions but more the path of the sun across the sky (Kunen et al. 2002). Ritual activities including the placement of internments are meant to mimic this journey. Maya see east as the direction of the sunrise, north as the position of the sun’s zenith, west as the direction of the sunset, and south as the point at which the sun is at its lowest (Kunen et al. 2002:208). Coggins (1988:67) notes the directionality produced by Maya cosmology “is basic to all Maya ritual and is involved in prayers and invocations” (Kunen et al. 2002:208). Following this, Gillespie (2000b) and Vogt (1976) give evidence for the Maya house as a miniature representation of the cosmos with ritually symbolic directional spaces imbued within it.

According to Gillespie (2000a) east and north are the most important ritual directions because they were marked by the growth of the first trees at the time of creation. East is associated with the rebirth of the sun with north representing the pinnacle of the sun’s daily journey. These two directions also “connect the daily birth, death, and rebirth of the sun with the birth and death of humans and their rebirth as ancestors” (Kunen et al. 2002:208). Maya believe houses are alive and must be fed offerings, much like ancestors who are reborn and inhabit ritually significant spaces within the house (Gillespie 2000b). Therefore, the location of caches with offerings and burials are significant indicators of social status and ritual meaning because the placement enhances their ability to act as portals to the Otherworld (Schele and Freidel 1990).

MORTUARY PRACTICES

The ancient Maya preferred inhumation, while their neighbors, the Aztecs, preferred cremation (Webster 1997). Maya interments primarily occur in and around the residential sphere with an occasional detached cemetery, or special burial plot (Tiesler and Cucina 2007; Webster 1997). At the same time, there are many examples of tombs and crypts located in temple structures erected specifically for the interment (Welsh 1988). Because of the widespread practice of residential burial, finding graves has become commonplace for Maya household archaeologists. In the house, high status individuals are more likely to be interred in simple graves placed in ritually significant places, such as entrance ways, while
individuals interred under floors, beneath adjoining plaza surfaces, within the fill of new construction, or in domestic midden pits, have been considered lower status (Uruñuela and Plunket 2002; Whittington and Reed 1997a). Tombs and crypts have been found in residential dwellings and generally contain wealthier grave goods, but Welsh (1988) argues that location over grave type is the more important factor for assuming the social status of the internment. Therefore, an important assessment of status is the type of architecture an individual is found in and their location within that structure (Chase 1997; Webster 1997). Uruñuela and Plunket (2002) suggest there was a selective internment process associated with differential social ranking, and lineage lines for individuals placed in sacred locations or in ancestral shrines. This same argument can be put forth for the lineage shrine, Chuck located in the Gypsy structure at Guerra (Structure GR-1-2nd/3rd).

The positioning of the body in death varies greatly in the Maya region. A common form is the extended position, in which the body is place on the stomach or back with the head and feet at opposite ends. Often in ancient Mesoamerican burials, an individual in this position is interred with the head placed south (Black 2007; Kunen et al. 2002; Mitchell 2006; Uruñuela and Plunket 2002). Another type is the flexed position where the knees are brought up to the chin, akin to the fetal position. And lastly some interments are bundled in which case an individual is tightly wrapped in a ritualized manner, though this form is generally used for ancestor veneration (McAnany 1998; Welsh 1988), which will be discussed below. Classic period Maya burials in Belize represent a mixture of all of these burial types where this variation seems to correlate less with social status than site-specific preferences (Chase and Chase 1996; Connell 2003; Pendergast 1999; Welsh 1988). The exception to this is ancestor bundles which seem to remain constant (Guderjan 2004).

Orientation of the head (the direction to which it points in the grave, i.e. north, south, east, or west) also seems to be site specific. Welsh (1988) suggests the directions hold specific cosmological significance for each site which may explain the differences.

Associated artifacts, or material culture, within a burial are vital resources for interpreting the cultural framework of an individual. They give clues about the social organization, social values, and even trade relationships which inform anthropologists about the inter- and intra-group interactions over time (Hammond and Gerhardt 1990; Healy et al. 1984). When an object becomes a grave good it is essentially lost forever; thus it is expensive
to bury an object or material which is hard to obtain. In other words, when rare materials such as jade or gold are buried it infers that these objects held more ritual significance in association with the buried individual than with the day to day activities of the living community. Common Maya grave good materials include various marine resources, bones and teeth, obsidian, ceramics, and jade in the form of beads, pendants, utilitarian objects, pottery, and figurines (Welsh 1988). Because of Belize’s proximity to the coast, it is not surprising that shells and other marine resources made their way into Maya burials (Chase and Chase 1996; Guderjan 2004). Carved animal bones may have held ritual significance to individuals interred with them (Mayes and Barber 2008). Obsidian was used throughout the Maya area for lithic points, blades, and even art (Miller 1999). Ceramic vessels are found in many burials in the forms of caches (Chase and Chase 1996), food containers for offerings (Fry 1979) and ceramic plates that have been placed over the head of the deceased (Wanner et al. 2007). Jade is a highly valued material in Maya culture associated with life, growth, the maize plant, and the sun god K’inch A-haw (Guderjan 2004; Miller 1999). Burials found with the greatest amount, and most lavish, grave goods have been in association with temples, and to a lesser degree, household shrines and ceremonial platforms (Welsh 1988:146).

**ANCESTOR VENERATION**

Though the Maya buried their dead in many structures and locations, some internments held greater ritual significance than the rest. These were the burials of the ancestors. Gillespie (2000a:144) describes ancestors as “the metaphysical link connecting the members of the house to their origins” who intervene daily in the lives of the living inhabitants. According to Patricia McAnany (1998:273) “from the very start, the maintenance of links with the deceased via physical proximity within a built environment is a prominent characteristic of Maya society”; therefore, ancestor veneration was a practice observed by both elite and non-elite members of the community. Specific buildings were erected or platforms built, commonly in the easterly direction, though this is variable (McAnany 1998), to accommodate these burials. Many of the ancestor shrines are described as “household shrines” (Welsh 1988:189) because they were located within the plazuela group with the primary function of ancestor internment and worship. McAnany (1998)
suggests ancestors were buried in the home to honor them as well as the celebration of the continued success of the lineage; she goes as far as to say that ancestors were so heavily tied to the home environment that structures found without burials should not be classified as residential dwellings. In Vogt’s (1969) ethnographic work with the Zinacantan Maya, he states that the most important deities for which daily rituals are performed, are the ancestral gods. He reports that every household in the community contains within it a shrine to honor the ancestors, though only higher ranking houses included ancestor burials. Some studies have shown that there is no preference for males or females interred in ancestral shrines. McAnany (1998) outlines burials from Tikal, Cuello, and K’axab which contained adult males and females and saw this pattern amplify by the Late Classic. At Caracol, Belize during the Late Classic period, adults and subadults of both sexes were interred in ancestral shrines (Chase and Chase 1996). However, Uruñuela and Plunket’s (2002) study of an earlier population suggests there was a specific age and sex selection as few adult females were interred in ancestral shrines with infants and children buried in a separate location within the house. Perhaps there was a shift in practices.

Ancestral burials are characterized by several elements. The first, as noted above, is the ritualized placement of an ancestral burial within the house. Another is the long lasting treatment of the dead, including selective retention of specific anatomical parts, particularly parts of the face or the whole cranium (McAnany 1998; Welsh 1988). Welsh (1988:Table 111) also notes some instances in which the de-fleshing and/or removal of hands and femurs were indicators of ancestor veneration. Later in the Classic period sequential internment of multiple individuals became more widely practiced aspect of ancestor ritual (McAnany 1998). Both Mitchell (2006) and Black (2007) report extra skulls in burials of the Royals at Buenavista del Cayo and sub-elites at Angel and Archangel suggestive of ancestor veneration. However, burials in Guerra also exhibit extra femurs. It is possible that the burial at Tatu (BV84-B9) may have contained an additional skull because two people are represented in the post cranial remains, but three in the dental record. Tatu is not as high status as the Gypsy plazuela group, but held higher status than Dart or Sara, and may have contained a household shrine. Gypsy contains two burials exhibiting an extra anatomical part. BV84-B7 includes and extra skull, and BV84-B4 includes an extra femur.
MATERIALS AND METHODS OF SKELETAL ANALYSIS

The remains being assessed for this thesis were excavated from four different structures Gypsy, Tatu, Dart, and Sara all of which date to the Classic period (AD 200-900). Gypsy, Chuck, Feature 2, Burial 1 is a mass internment. Due to the nature of this burial, at the time of excavation it was not possible to match up remains definitively or state the exact number of individuals present. The combination of time and erosive soil has left these individuals poorly preserved and severely fragmented. For this reason, I was able to determine the minimum number of individuals (MNI), establish a base age range, and estimate sex for the remains present, but not re-unite specific individuals. For all remains, before analysis was undertaken, bones were cleaned and, when possible, reconstructed. For archival purposes, all remains were photographed and described in detail. Due to the fragmentary nature of this collection, several different methods for age and sex were used depending on the element present for analysis.

Age Assessment

Age categories were defined as infant (0-1 years), child (2-7 years), sub-adult (8-19 years), young adult (20-30 years), middle adult (31-40 years), and old adult (41+ years). For some individuals a defining age break down was not possible, but determination of adulthood was, so an overarching assignment of “adult” was given. There were no infants in this collection, so this category is not used further. Sub-adult age was determined using epiphyseal union stages of the post crania, and developmental stages of the skull and dentition as outlined by Buikstra and Ubelaker (1994), Scheuer and Black (2004), and Schaefer et al. (2009). Matching specific individuals in the mass burial was not possible, therefore the first step was to identify the sequence of union in the epiphyses present (Schaefer and Black 2007) and establish a basic age breakdown. In many cases long bone epiphyses were absent. When this was the case, pelvic development and stages of union for the iliac crest, and ischial tuberosity were used. If possible age determination was assessed for the pubic symphysis using both the Suchey-Brooks (Brooks and Suchey 1990) and Todd (1921) methods. Corresponding casts and descriptions were used to ensure accurate age assessment. If an individual fell between two phases, the age range was estimated based on whether the morphology more closely corresponded with the earlier or later phase.
According to Lovejoy et al. (1985) the auricular surface has a greater survivability rate than does the pubic symphysis and, while more difficult to interpret, is a more accurate age estimation than the pubic symphysis. Most auricular surface elements present for this thesis were incomplete but possessed enough morphology to describe some age-related changes; in some cases this lead to a conservative age estimation.

On some occasions sternal rib ends were present and age variation was assessed based on changes described by Iscan et al. (1984). I scored amount and placement of suture closure, using the codes outlined in Buikstra and Ubelaker (1994). Determining a composite score for age range was not always possible, therefore, I used the age estimation) for specific sections of the vault sutures. Palate suture closure as outlined in the Smithsonian Protocol Manuel was also used. According to Buikstra and Ubelaker (1994) there is considerable variability in suture closure rates between individuals and populations. However, even with the resulting broad age ranges, this method is helpful if it is the only means of aging.

As previously stated, due to the incomplete nature of many of the skeletons, every possible aging method was used and compared to each other to gain a more accurate age estimation for each individual. In some cases, I could not narrow the age further than to say the individual was over the age 20 or 25 years at the time of death.

**Sex Assessment**

As with age, sex determination utilized a variety of methods depending on the elements present. These methods were then compared to determine an accurate sex estimation. For taphonomic reasons one individual (BV-84-B10) was of undeterminable sex. I was able to at least assign a “probable” sex to all other individuals. The pelvis, being the most reliable element for sexing, was used whenever possible. There were no complete pelves in this collection, therefore not all traits were available for each individual. Sex differences in the ventral arch, subpubic concavity, and ischiopubic ramus ridge as described by Phenice (1969) were employed and scored as male, ambiguous, or female. Sexual morphology of the skull was used, and although also highly fragmentary, more elements were present for assessment than from the pelvis. The nuchal crest, mastoid process, glabella, mental eminence, and supra-orbital margin were assessed and scored as either male, probable male, ambiguous, probable female, or female. The supra-orbital margin was particularly
useful for this population because the superior eye orbit, though fragmentary, was most commonly present and distinguishable between the sexes. Additional traits such as the zygomatic root, mandibular shape, gonial angle, and forehead shape were described as either male, female, or ambiguous (Buikstra and Ubelaker 1994). It was difficult to tell if any traits were similar in both sexes because of the incompleteness of the individuals, but the supra-orbital margin and mastoid process seemed to be sexually dimorphic in this population and were weighted more heavily for sex estimation.

**The Burials**

Following is a description of the location and terms of internment as well as brief summary of skeletal age, sex and pathology of each individual.

**BV84-B1**

Interred just in front of GR-1 (Gypsy group, Chuck platform, in Feature 2) BV84-B1 is a mass burial with a minimum number of individuals (MNI) of seven, all adults (Figure 4). Falling on the cusp of the Late and Terminal Classic periods at A.D. 780-840 this burial is the youngest in the group and may have postdated the occupation and maintenance of Gypsy (personal communication, Joseph Ball 2011; Taschek 1984). This burial most likely served as a successive internment location over a short period of time, a few months to up to five years (Taschek 1984). The bodies were buried on top of each other in an extended position with heads to the south (Figure 5). This made segregation of individuals, with any degree of certainty, impossible during excavation. Immediately overlaying the skeletons was an incomplete set of limestone slab capstones which was resting above the top most skeleton. Because of this, some boney elements were crushed beyond recognition (Taschek 1984). This grave contained no associated material culture or grave goods.

There are six left and six right femoral shafts present belonging to six adult males. A left and right humerus and mid clavicle fragment of considerably smaller size than the others in this burial is also present. However, even with the small size, the cortical bone is thick, suggesting this individual is an adult, possibly female. These elements lead to an MNI of seven. The field notes denote the presence of ten skulls at the time of excavation (Taschek
1984), but I was only able to reconstruct five. There may be small segments of five more skulls, but they are by no means complete. Five skulls was confirmed by the presence of five upper left lateral incisors. All five skulls exhibit male traits: zygomatic root extends past the external auditory meatus; long, broad mastoid process; pronounced supraorbital torus; and rounded supraorbital margins.

Of the 76 teeth associated with these five people, all exhibit attrition, 14 possess carious lesions, and 16 exhibit linear enamel hypoplasias developed between the ages of three and five years old. Seven maxillary teeth (five central incisors and two canines) exhibit dental modification in the form of filing.

This burial contains one instance of healing and healed cribra orbitalia and two occipital fragments belonging to two different people exhibit healed porotic hyperostosis. These pathological conditions are indicative childhood anemia. In addition, several vertebral bodies exhibit compression and trace arthritic lipping with slight spicule formation.
BV84-B2

Located in front of GR-1 (Gypsy group/Chuck platform, in Feature 2B) and just below BV84-B1, BV84-B2 is a cyst burial (Taschek 1984). Separated from B1 by a coherent row of capstones and dressed limestone slabs, there are two adults [a middle adult male (Individual 1) and adult female (Individual 2)] interred in this burial. With no associated grave goods, this burial falls in the full Late Classic at A.D. 740-780.

About half of each individual is present. However, all the elements are quite fragmentary and very minimal reconstruction was possible for these individuals. Skull and pelvic fragments of Individual 1 indicate male. Skull fragments and comparison in bone size and robusticity for Individual 2 indicate female. Aging these individual was somewhat difficult. Fragments of the auricular surface were present for Individual 1 and morphology (Lovejoy et al. 1985) indicated this person was a middle adult around 30-39 years of age at the time of death. It was difficult to narrow down Individual 2’s age because there was an absence of epiphyses, pelvic elements, and sutures. It can be said that individual was over
25 years old at the time of death because the maxillary first and second molars are present for her and are in full occlusion.

All the dentition in this burial exhibit attrition, a majority possess calculus buildup, and a few exhibit carious lesions. Linear enamel hypoplasias are present with most occurring between the ages of three and four years. A molar exhibits a hypoplastic defect with an onset age of 6.8 years which is the oldest age of onset in Guerra. A maxillary right central incisor is modified by filing; the same as some exhibited in BV84-B1. Periodontal disease is evident through maxillary and palatine porosity, and slight alveolar resorption. The mandible which I believe belongs to the female is severely pathological. The bones is swollen, porous and exhibits antemortem tooth loss with some healing. Other than this mandible, there is very little pathology in this burial, part of this may be the fragmentary nature of many of the elements. One thoracic body exhibited slight lipping just inferior to the superior border on the posterior portion. A humerus shaft, side unknown, exhibits small musculoskeletal stress marker formation.

**BV84-B3**

Located in the stair core of GR-1-2nd (Gypsy group, Chuck platform, in Feature 3), BV84-B3 was interred with BV84-B3, discussed below. These burials fall during the full Late Classic at A.D. 680-720/730. BV84-B3 is a sub/young adult possible female and B4 is a young adult male. Originally the two skeletons were probably lying parallel to each other, though they were overlapping at the time of excavation. This overlapping was most likely the result of post deposition disturbance. There were no overlaying capstones, but a box-like crypt was made from a discontinuous row of limestone slabs set on the edges around and between the two individuals. One obsidian blade was found in association with these skeletons. BV84-B3 was interred in an extended position with the head to the south but, was not interred with an associated skull (Taschek 1984; Figure 6). The absence of associated grave goods apart from the obsidian blade suggest the possibility that these individuals were a sacrificial offering. However, a femoral shaft not belonging to either individual is present in this burial. Taking into consideration the extra femur and the burial’s location in the stare core of a lineage shrine, another explanation may be this individual was an ancestor, as many ancestor heads were removed for veneration (McAnany 1998; Welsh 1988). In addition,
Figure 6. Gypsy group, Chuck platform, feature 3 (BV84-B3). Photo by Jennifer Taschek.

BV84-B7, discussed below, is considered a lineage leader burial and also contains an obsidian blade, further supporting the notion of ancestor veneration.

Pelvic elements including the pubic symphysis, iliac crest, ischial tuberosity, and auricular surface aided in sexing and aging this individual. The pubic symphysis possessed mostly female characteristics, though not completely, so a determination of probable female was made for this individual. Age related morphology of the pubic symphysis (Brooks and Suchey 1990; Todd 1921) estimate an age of around 18-24 years at the time to death. The auricular surface exhibited morphology (Lovejoy et al. 1985) suggesting a narrow age of 20-24 years. Neither the iliac crest or the ischial tuberosity are fully fused, though both are in
the process of fusing which puts this individual around 17-24 years. This female seems to be at the lower end of each of these ranges the age falls on the cusp of sub-adult and young adult categories around 17-24 years of age at the time of death.

This individual exhibits slight muscle or ligament tearing on the distal end of the radius, and the proximal and distal fibula. The interosteous crest of both radii, the ulna and the fibula are built up and extend far off the shaft. A portion of the right fibula exhibits porosity accompanied with slight new bone formation and may be healing periostitis.

**BV84-B4**

Located in the stair core of GR-1-2nd (Gypsy group/Chuck platform, Feature 3), BV84-B4 was interred with BV84-B3, above. These burials fall during the full Late Classic at A.D. 680-720/730. As stated above, B3 is a sub/young adult possible female, and B4 is a young adult male. Originally the two skeletons were probably lying parallel to each other, though they were overlapping at the time of excavation. One obsidian blade was found in association with these people. This individual was laying extended with the head to the south (Figure 7). Though there are no associated grave goods beyond the obsidian blade, there is an additional femur located in this burial which does not belong to the female. Welsh (1988:Table 111) outlines several examples where the removal of the femur is an indicator of ancestor veneration. This, combined with the removal of the female’s head, the obsidian blade, and the internment location at the core of the stairs, above a suspected lineage leader burial (BV84-B7, Feature 4B, see below) suggest this may be an ancestral burial.

Temporal, frontal and pubic symphysis fragments were available for sexing this individual and exhibit confidently male traits. For aging this individual, the pubic symphysis possessed morphology (Brooks and Suchey 1990; Todd 1921) suggesting an range of 15-24 years. The ischial tuberosity is in the process of fusing, but the femoral head is completely fused. A combined age estimate for this young adult falls between 20-24 years at the time of death.

Although this individual is young, his molars and one canine exhibit severe attrition at odd angels with grooving which is consistent with occupational activities. The teeth exhibit carious lesions, and possess moderate calculus buildup. Linear enamel hypoplasias are present and developed between 4.5 and 5.5 years of age.
This individual exhibits several pathological changes including periostitis of the ribs, possible early onset osteomyelitis on the right tibia, and slight arthritic lipping from thoracic 11 to lumbar five with a bias towards the left side. In addition, both tibias are bowed. Neither of the femurs or fibulas are bowed though, which may rule out rickets and instead suggest a developmental defect.

**BV84-B5**

BV84-B5 (GR-1-3rd: Gypsy group, Chuck platform, Feature 4) is located in the stair core just below BV84-B3 and B4 (Feature 3) described above and separated from them by a thin layer of core material (Taschek 1984). This burial, containing an old adult male, is
associated with BV84-B6, an old adult possible female, who will be discussed below. These two adult burials are of the few that come from the Middle Classic period and date around A.D. 680 +/- 20 years (personal communication, Joseph Ball 2011). The individual in BV84-B5 was interred face down, or prone, in an extended position with the head to the south. Interred in a limestone crypt with slabs around the edges and across the top, the capstone of the crypt was at the level of the chopped, burnt floor of the earlier structure which means the floor had been cut for the placement of the skeletons in B5 and B6 (Taschek 1984).

This individual is very fragmentary, though enough elements are present to age and sex with some certainty. Temporal, frontal, and mandibular morphology are consistent with male traits. A large portion of the skull including sutures were available for aging this individual. Many sutures were fused endo- and ectocranially placing this individual around 40 years at the time of death, but the beginning fusion of the intermaxillary suture place this individual closer to the age of 50. Therefore, this individual is an old adult male who was between the ages of 40 and 50 years at the time of death.

All dentition exhibit attrition, but the maxillary teeth are more severely worn than the mandibular. However, all the mandibular molars and all but one maxillary molar had been lost antemortem. The mandible exhibits complete healing while the maxilla was still in the process of healing at the time of death. A moderate to large amount of calculus is present on all the teeth. A few teeth exhibit carious lesions, one of which has consumed the enamel tooth crown. The maxillary canines exhibit linear enamel hypoplasias indicating a stressful episode around the age of four years old in this individual.

Few pathological changes were exhibited on this individual, however, the articular surface for the dens on the first cervical vertebra, and the dens itself on the second cervical vertebra each express an arthritic boney spicule extending about 2mm off the bone. An unsdieable mid-shaft fibular fragment exhibits a raised segment with porosity that may be healed periostitis.

**BV84-B6**

BV84-B6 (GR-1-3rd: Gypsy group, Chuck platform, Feature 4) is located in the stair core just below BV84-B3 and B4 (Feature 3) described above and separated from them by a
thin layer of core material (Taschek 1984). This burial containing an old adult possible female is associated with BV84-B5, an old adult male, discussed above. These two adult burials are of the few that come from the Middle Classic period and date around A.D. 680 +/- 20 years (personal communication, Joseph Ball 2011). The individual in BV84-B6 was interred prone in an extended position with the head to the south. Interred in a limestone crypt with slabs around the edges and across the top, the capstone of the crypt was at the level of the chopped, burnt floor of the earlier structure which means the floor had been cut for the placement of the skeletons in B5 and B6 (Taschek 1984).

This individual is slightly more complete than BV84-B5, though still very fragmentary. A fair amount of the skull was present for sexing as well as an almost complete mandible. Overall this individual possess more female traits than male traits. The supraorbital margins are a distinct characteristic for this population. This individual has sharp supraorbital margins along with a majority of female traits which led to a determination that this individual is a probable female. Some epiphyses, part of the sacrum, and the sternal end of a rib were available for aging this individual. The distal radial epiphyses was completely fused as were sacral vertebra three through five, placing this individual over the age of 23 at the time of death. The sternal rib end yields morphology (Iscan et al. 1984) consistent with an age range of 45-71 years. Given the lifespan of the Maya, this female was probably closer to 45-55 years of age at the time of death.

More than half the teeth present for this individual exhibit carious lesions, three have multiple caries, and four teeth exhibit lesions too large to determine a point of origin. Every tooth exhibits slight to moderate calculus formation. As with BV84-B5 the mandibular molars were lost antemortem and exhibit complete and almost complete healing. One abscess is present on the buccal surface of the mandible and the maxilla has a possible abscess, also on the buccal surface. Linear enamel hypoplasias are present with an age of onset around 3.5 years and then again at five years.

As with BV84-B5, this individual does not exhibit many pathological changes. Five cervical vertebra centrum fragments and a lumbar articular facet exhibit arthritic changes including extensive lipping with curved boney spicules around the margins. The right distal fibular fragment has a raised surface exhibiting porosity which may be healed periostitis as well.
BV84-B7

BV84-B7 is a double internment located in the stair core of Chuck (GR-1-3rd. Gypsy group, Chuck platform, in Feature 4B) just below BV84-B5 and B6. Also interred in the Middle Classic, BV84-B7 is separated from B5 and B6 by a discontinuous row of capstones and predates these by around 100 years at A.D. 580-640. Two individuals [an old adult male (Individual 1) and a subadult possible male (Individual 2)] were interred in this burial laying prone with their heads to the south (Figure 8). They were originally separated by one limestone slab lying on its edge with limestones lining each side of the crypt. The only associated material culture is an obsidian blade laying near the head of one of the individuals (probably Individual 2). An extra skull was also laying in the pelvic area of the same skeleton suggestive of ancestor veneration. The location within the stair core of this platform, the extra skull, the associated obsidian blade, and the dental modification of Individual 2 are highly suggestive of this being a lineage leader internment. Over time, the elements of these individuals have become co-mingled. I was able to separate many of the remains, but not all of them.

INDIVIDUAL 1

The remains of Individual 1 are highly fragmentary, and overall this individual is fairly incomplete. Only two elements were available for sexing, the temporal and occipital bones. Morphology of both bones are predominantly male and overall the bones of this individual are robust and quite large which led me to determine this individual is a probable male. A left sternal end of the clavicle, the superior portion of the coronal suture, a left sternal rib end, and the intermaxillary suture were available for aging this individual. The left sternal end of the clavicle possesses the epiphysis which covers the entire surface, putting this individual over 29 years of age (Scheuer and Black 2004). The superior portion of the coronal suture is completely fused both endo- and ecto-cranially putting this individual between 25 and 70 years old. Sternal rib end morphology (Iscan et al. 1984) is consistent with an age range of 44-56 years at the time of death. In addition, the intermaxillary suture has begun to fuse which corroborates the aging of the rib and put this individual closer to 50 years of age at the time of death.
Individual 1 has only two teeth present, the mandibular right first molar and the maxillary right lateral incisor which exhibits a root caries that has demolished the enamel. Many of the teeth have been lost antemortem. Pathological changes consistent with periodontal disease, including porosity and alveolar resorption indicate the disease was active in this individual at the time of death. A lumbar centrum exhibits arthritic lipping with minimal bony spicules raised off the margin. This individual also exhibits healed porotic hyperostosis on the superior portion of the occipital along the lambdoid suture. There are some pathological changes to the long bones, but it cannot be said for certain if they belong
to Individual 1 or 2 because no epiphyses are present. The left femur exhibits changes possibly associated with active osteomyelitis and two fibular fragments may have healing periostitis.

INDIVIDUAL 2

Individual 2 is just as fragmentary and incomplete as Individual 1. Skull morphology is consistent with characteristically male traits, but the estimated sex of this individual is not concrete, given the age and limited elements available. The dentition, sternal end of the left clavicle, and distal epiphyses of three hand phalanges are present for age estimation of this individual. The right maxillary and mandibular first molars are present and exhibit slight attrition suggesting these teeth were in full occlusion, putting this individual between 12 and 15 years. However, there are two dental inlays and a filed tooth. Given that Maya individuals under the age of 15 rarely exhibit dental modification (Williams and White 2006), this individual is likely closer to 15 than 12. Morphology of the sternal end of the clavicle places this individual under or around the age of 18. In addition, three distal phalange epiphyses are almost completely fused placing this individual on the upward end of 13-19 years. Putting these together, this male was probably between the ages of 15 and 19 at the time of death.

Individual 2 exhibits three teeth that have been culturally modified, including a jade and a hematite inlay, and dental filing. Trace to moderate attrition is expressed on the teeth of this young man, but no dental caries are present. Minimal signs of periodontal disease are exhibited in the maxilla.

There are some pathological changes to the long bones, but I cannot say for certain if they belong to Individual 1 or 2 because no epiphyses are present. The left femur exhibits an eaten away look; the point of origin came from the interior medulary cavity suggestive of early onset osteomyelitis. Two fibular fragments, one from the the left the other unsideable exhibit small swollen, porous segments which may be healing periostitis.

BV84-B11

BV84-B11 (GR-1-2nd, Gypsy group, Chuck platform, in Feature 1) was interred below the stair core facing of the platform. This single internment of an adult probable male dates to the full Late Classic period at A.D. 720-740 and is located over and just in front of BV84-B3 and B4. BV84-B11 was interred in an extended position with the head to the south.
The west half of this burial was carried down the slope of the structure by recent erosion, so the missing elements of this individual may be attributed to this. No associated grave goods were found in this burial.

This individual is fragmentary but fairly complete. Small fragments of the maxilla are present, but none of the maxillary dentition. Only the supraorbital margin was available for sex estimation. The margin was very round, which is a male trait. The bones are also large and robust with very built up muscle attachment sites. This could further indicate male, however, without additional skeletal evidence, the sex estimation of male is cautious. In the absence of pelvic elements, dentition, and long bone epiphyses, aging this individual yielded an open ended range. All suture elements available were open. The epiphyses of the distal hand phalanges are fused, indicating this individual was an adult at least over 19 years of age at the time of death.

As previously stated, no maxillary dentition is present for this individual. Only three teeth are present and remain in their mandibular tooth sockets. However, the left lateral incisor and left canine crowns have been broken postmortem. The right canine is missing the crown as well, but due to an extensive root carie. No other pathological conditions were observed on this individual.

**BV84-B8**

BV84-B8 (GR-32, Dart group, Darkri patio, Feature 1) is a multiple internment containing two adults (two probable males) and the only child recovered from Guerra, located in the patio of the Dart group structure. This internment was placed in this structure around A.D. 700-780 during the early Late Classic period and is located in the middle segment of the patio. The capstones for this cyst were not very large or dressed and were irregularly shaped limestone rabble. The stones overlaying the skulls may have crushed them over time. Field notes indicate the remains were already fragmentary in the ground and removal and separation of elements was difficult (Taschek 1984). These individuals were interred prone with their heads to the south and have no associated grave goods (Figure 9). In addition, the archaeological context of this structure is of a low status non-elite family (personal communication, Joseph Ball 2009).
Preservation of these individuals is decent for the area, but the remains are highly fragmentary and completely commingled. Some association based on taphonomic processes and size were possible. The skulls and dentition are the most intact portions of each individual. Because of this, identification and analysis largely comes from the skull morphology and dentition. Individual 3 is the child who has the least associated remains.

**INDIVIDUAL 1**

Based on skull morphology, this individual as a probable male. Aging of this individual is very broad. None of the sutures present were fused, but this may have more to
do with the fragmentary nature and the many sutures missing. No epiphyses are present either. However, based on the development of the skull and the teeth present, individual classified as an adult.

**INDIVIDUAL 2**

Individual 2 has more skull elements present than Individual 1. Overall this individual exhibits more characteristically male traits, allowing this individual to be classified as male. Much like Individual 1, aging Individual 2 is very broad. Though more skull fragments are present, very few sutures are present and those that are, are open. However, based on the development of the skull and the teeth present, this individual is an adult.

This individual exhibits some pathological changes to the skull. Active and healing fine porosity on the frontal and parietal along the coronal and sagittal sutures is present, as is porosity at glabella. The diploe has expanded slightly. In addition, there is a small section above the external auditory meatus that exhibits porosity and woven bone formation.

**INDIVIDUAL 1 AND 2: TEETH**

There is no associated alveolar bone and the dentition is worn in a similar manner so a distinction between Individual 1 and 2 is not possible. All the dentition exhibit slight to moderate attrition rates. Several teeth exhibit carious lesion, three of which contain multiple caries, and five with lesion too large to determine a point of origin. Linear enamel hypoplasias are present all exhibiting an age of onset at around three years. This suggests either these particular teeth are from the same individual, or both Individual 1 and 2 exhibited similar stress episodes at the same age.

**INDIVIDUAL 3**

This individual only has a skull and dentition associated, though no alveolar bone is present. Because this individual is a young child, sex is undeterminable. All the deciduous dentition is present as are most of the developing permanent teeth. Based on the crown and root developing of these permanent teeth, this child was between five and six years old at the time of death. One permanent maxillary left central incisor and one deciduous maxillary first molar exhibit linear enamel hypoplasias. The location of a defect on the deciduous maxillary first molar is an indication of an in-utero stress episode (Schaefer et al. 2009) reflecting the
health of the child’s mother. One of the permanent incisors exhibits two defects; the first occurred around the age of three, the other occurred shortly after, around the age of four.

**BV84-B9**

BV84-B9 (Tatu group, Parrot patio, Features 4 and 4A) is a multiple interment dating around A.D. 420-500 during the Early Classic. This burial located in the patio of the Tatu structure group is the earliest of the analyzed material at Guerra. Based on the dental analysis, three adult individuals are buried here. Field notes indicate there are only two individuals, therefore, the skeletal evidence indicate there may have been an extra skull in the internment making it three people. The preservation of this burial is very poor as the yellow clay common in the region has deteriorated much of the skeletal material (Figure 10). This internment represents a typical cyst burial surrounded by fist sized cobbles on the east and west sides and capped with dressed limestone slabs. Both individuals were interred prone with their heads to the south. Originally the two individuals were interred one on top of the other separated by a thin layer. The individual interred on the bottom had the hands and feet crossed suggesting it was wrapped in something prior to internment (Figure 11). An obsidian blade was found in the pelvic region of this individual as well (Taschek 1984). Body wrapping and internment with an extra skull are suggestive of ancestor veneration (McAnany 1998; Welsh 1988) and given that two obsidian blades were found associated with lineage shrine burials in Gypsy, this too may suggest an ancestral burial. In addition to the burial implications, archaeological analysis indicates a good amount of energy was expended for the building and maintenance of Tatu suggesting this site housed a wealthy, higher status non-elite residential group (personal communication, Joseph Ball 2009).

The remains in BV84-B9 are highly fragmentary and very incomplete. Only broad assessment of age and sex are possible. The limited discernible skull morphology suggests at least one individual in this burial is male. Although there were no other definitive features for determining sex, the large and robust nature of all post-cranial material present suggests that both individuals in this burial are male. However, a definitive assessment is not possible. Based on the wear of the teeth, particularly the molars present, combined with the size of the long bones, all individuals were classified as adults. A further narrowing of age is not possible based on the incompleteness of the remains. Most of the teeth exhibit moderate to
severe attrition rates. Many exhibit carious lesions and two teeth exhibit linear enamel hypoplasias. The determined age of onset of these is between three years and 3.5 years of age.

**BV84-B10**

BV84-B10 (GR-14, Sara group, Granny patio, Feature 28A) is a single internment of an Early Classic burial dating to A.D. 420-500. This burial was lined with a discontinuous row of limestone cobbles and capped with a limestone slab located in the patio of the Sara group structure. This adult of undeterminable sex was interred prone with the head to the south. The hands were crossed at the pelvic region, much like the other Early Classic burial at Tatu (BV84-B9; Figure 12). Sherds were found in the burial belonging to a crude-ware jar which may have been purposefully placed in with the individual at the time of death.
Overall this individual is very incomplete. The most complete and identifiable segments are the long bones which include segments of the epiphyses. The left auricular surface is present, but too badly damaged to assess morphological changes for age estimation. Based on the size of the bones, the fact that all present epiphyses are fused, and the presence of a heavily worn third molar puts this individual as an adult, probably over the age of 25 at the time of death. No elements are available for reliable sexing of this individual either. Overall the bones are large and robust and the fibula is similar in size to B9, so this individual might be male but no definitive conclusions can be made. All the teeth exhibit moderate to heavy attrition rates and two exhibit carious lesions. Calculus was not
recordable. Six teeth exhibited linear enamel hypoplasias, with ages of onset occurring between the ages of four and five years.

**RESULTS**

Following are the results for demography and mortuary practices within Guerra.

**Demography**

Twenty-three individuals were analyzed for this thesis. Table 1 summarizes the age, sex, temporal classification, and culturally important elements of the individuals recovered from Guerra. A significant bias is skewed toward males in this skeletal sample. Of these 23 individuals, 15 were determined to be male, or probable male with only four female or probable female estimations. Three individuals were of undeterminable sex, two of which were due to severe taphonomic processes. The third individual is a child age 5-6 years which is too young to determine sex.

Age distribution was skewed to adults. Out of 23 individuals there were no infants and only one child. One subadult was present, and another individual on the cusp of sub- and young adulthood, with the remaining 20 individuals reaching adulthood before death. Of these 20 individuals, 15 could not be aged beyond “adulthood” which is defined as over 20 years. The remaining five have been broken into young adult, middle adult, and old adult. One individual was determined to be a young adult. One individual falls in the middle adult range and the remaining three are old adults.

Looking at the burials by time period, both Sara and Tatu yielded Early Classic period burials. Taphonomic impact prevents a detailed analysis of demography. Three individuals were analyzed from this period, two possible male and one individual of undeterminable sex. All three of these individuals are adults, but the age could not be narrowed further.

Four individuals were buried during the Middle Classic period in Gypsy wherein only one was a possible female and the other three were estimated as male. More than half the individuals were adults in this period. Three of the individuals were old adults at the time of death, two males and one female. The fourth individual was a subadult male. Eight individuals were interred during the full Late Classic period. Five were buried in the Chuck platform in the Gypsy structure group, and three were interred in Dakri patio of the Dark
Table 1. Summary of Age and Sex Identification of Guerra Skeletons with Chronology and Burial Specifics

<table>
<thead>
<tr>
<th>Burial</th>
<th>Group</th>
<th>Patio</th>
<th>Feature</th>
<th>Individual Number</th>
<th>Date</th>
<th>Sex</th>
<th>Age</th>
<th>Extras</th>
</tr>
</thead>
<tbody>
<tr>
<td>BV84-B1</td>
<td>Gypsy</td>
<td>Chuck</td>
<td>2</td>
<td>MNI=7</td>
<td>Late/Terminal Classic</td>
<td>6 Males, 1 Female ?</td>
<td>Adult</td>
<td>Dental Filing</td>
</tr>
<tr>
<td>BV84-B2</td>
<td>Gypsy</td>
<td>Chuck</td>
<td>2B</td>
<td>1</td>
<td>Late Classic</td>
<td>Male</td>
<td>30-39 Midd le Adult</td>
<td>Dental Filing</td>
</tr>
<tr>
<td>BV84-B2</td>
<td>Gypsy</td>
<td>Chuck</td>
<td>2B</td>
<td>2</td>
<td>Late Classic</td>
<td>Female</td>
<td>Adult 25+</td>
<td></td>
</tr>
<tr>
<td>BV84-B3</td>
<td>Gypsy</td>
<td>Chuck</td>
<td>3</td>
<td>1</td>
<td>Late Classic</td>
<td>Probable Female</td>
<td>Sub/Young Adult (17-24)</td>
<td>No Skull, Obsidian Blade</td>
</tr>
<tr>
<td>BV84-B4</td>
<td>Gypsy</td>
<td>Chuck</td>
<td>3</td>
<td>2</td>
<td>Late Classic</td>
<td>Male</td>
<td>Young Adult (21-24)</td>
<td>Extra Femur, Obsidian Blade</td>
</tr>
<tr>
<td>BV84-B5</td>
<td>Gypsy</td>
<td>Chuck</td>
<td>4</td>
<td>1</td>
<td>Middle Classic</td>
<td>Probable Male</td>
<td>Old Adult (40-51)</td>
<td></td>
</tr>
<tr>
<td>BV84-B6</td>
<td>Gypsy</td>
<td>Chuck</td>
<td>4</td>
<td>2</td>
<td>Middle Classic</td>
<td>Female?</td>
<td>Old Adult (44-55)</td>
<td></td>
</tr>
<tr>
<td>BV84-B7</td>
<td>Gypsy</td>
<td>Chuck</td>
<td>4B</td>
<td>1</td>
<td>Middle Classic</td>
<td>Male</td>
<td>Old Adult (50-54)</td>
<td></td>
</tr>
<tr>
<td>BV84-B7</td>
<td>Gypsy</td>
<td>Chuck</td>
<td>4B</td>
<td>2</td>
<td>Middle Classic</td>
<td>Male?</td>
<td>Subadult (15-18)</td>
<td>Dental Inlay and Filing, Extra Skull, Obsidian Blade</td>
</tr>
<tr>
<td>BV84-B8</td>
<td>Dart</td>
<td>Dakri</td>
<td>1</td>
<td>1</td>
<td>Late Classic</td>
<td>Male</td>
<td>Adult</td>
<td>Dental Inlay</td>
</tr>
<tr>
<td>BV84-B8</td>
<td>Dart</td>
<td>Dakri</td>
<td>1</td>
<td>2</td>
<td>Late Classic</td>
<td>Male?</td>
<td>Adult</td>
<td></td>
</tr>
<tr>
<td>BV84-B8</td>
<td>Dart</td>
<td>Dakri</td>
<td>1</td>
<td>3</td>
<td>Late Classic</td>
<td>N/A</td>
<td>Child (5-6)</td>
<td>Obsidian Blade, Extra Skull</td>
</tr>
<tr>
<td>BV84-B9</td>
<td>Tatu</td>
<td>Parrot</td>
<td>4A</td>
<td>MNI=3</td>
<td>Early Classic</td>
<td>2 Male?, 1?</td>
<td>Adult</td>
<td></td>
</tr>
<tr>
<td>BV84-B10</td>
<td>Sara</td>
<td>Granny</td>
<td>28A</td>
<td>1</td>
<td>Early Classic</td>
<td>?</td>
<td>Adult</td>
<td>Crude ware pot</td>
</tr>
<tr>
<td>BV84-B11</td>
<td>Gypsy</td>
<td>Chuck</td>
<td>1</td>
<td>1</td>
<td>Late Classic</td>
<td>Probable Male</td>
<td>Adult 20+</td>
<td></td>
</tr>
</tbody>
</table>

structure group. In Chuck, three were males and two were females. Dakri contained two males and one individual of undeterminable sex (the child). Total for the Late Classic: seven males, two females, and one child of undeterminable sex. Age breakdown skewed to adult in this period as well. Four individuals were classified simply as “adult”, one individual was a middle adult, one subadult was present, one individual on the cusp between subadult and young adult, and one child was interred during the Late Classic. Chuck contained two “adults”, the middle adult, the subadult, and the sub/young adult. Dark contained two
“adults” and the child. Seven individuals were interred during the Late/Terminal Classic period just in front of the stair structure of Gypsy/Chuck. Six of these individuals were male, and the seventh is a possible female. All of these individuals were determined to be adult.

**Mortuary Practice**

Eleven internments contained the 23 individuals analyzed in this thesis. Nine burials were either multiple internments, or were associated with a contemporaneous internment. Six of these were located within Gypsy/Chuck; one from Tatu/Parrot, and the other from Dart/Dakri. Only two burials were single internments, one from Gypsy/Chuck, the other from Sara/Granny.

Every individual was interred face down, or prone, in an extended position with their heads to the south. One individual, from Early Classic Tatu, gave evidence of being wrapped prior to internment. Only the two Early Classic burials (Tatu and Sara) were noted to have the hands crossed at the pelvic area. Two burials contained an additional skull. One individual was interred without their skull and one burial contained an extra femur. Very little material culture was found in these burials. However, three burials contained an associated obsidian blade, two from Gypsy and one from Tatu. These same burials contained either an extra skull, or an extra femur.

**DISCUSSION**

One of the goals of the Mopan-Macal Triangle Archaeological Project (MMTAP) is to gain a more complete picture of Maya community life in the western Belize Valley by investigating both elite and non-elite segments of the population. The purpose of this chapter is to discuss how status within the lower group manifest itself in mortuary practices culturally and demographically.

Despite the fact that four structures yielded skeletal remains, the skeletal sample from the Guerra community is quite limited given the almost 300 years of occupation. Being a corporate group pattern, the Guerra suburb was probably well populated during this time. The question is, where are all the other skeletons? This question may not be able to be answered here, but the individuals that are present span several generations. Several researchers have suggested a selectivity to the burial of certain individuals in specific places within the house structure. i.e. ancestral or lineage shrines. Though this selection did not
always eliminate one sex over another, social position was almost always a determining factor in burial placement (McAnany 1998; Uruñuela and Plunket 2002). In their investigation of the village of Tetimpa, Uruñuela and Plunket (2002) came across a similar situation with limited number of skeletons for a substantial occupation. They counted the age of the individuals they had who were interred in the lineage shrines, much like the individuals of Gypsy/Chuck, and estimated that each lineage leader from each generation for 280 years were present. Looking at the ages of each individual in the Chuck platform and the time periods associated with them, they make up a continuum from the estimated beginning date to the ending date of Guerra’s occupation (5th-8th century A.D.). Therefore, even though many inhabitants are missing from the skeletal evidence, the individuals interred in the Chuck platform span the entire occupation of the sight and could very well have been the lineage leaders throughout this time.

The Guerra samples show a bias towards male skeletal representation than female. Some of this bias could be attributed to the severe fragmentation of the material which greatly affects accuracy and ability to estimate sex. Another explanation could be that there was a selectivity to the placement of certain sexes after death. Uruñuela and Plunket (2002) suggest there was a sex based selection for internment, especially in ancestral shrines, or places of ritual significance. Two of these structures are contextually higher status non-elite groupings, Gypsy and Tatu. Gypsy definitively contained an ancestral burial platform. Likewise, the obsidian blade, extra skull, and energy expenditure at Tatu suggests this may have contained an ancestral burial as well. A majority of the individuals interred here were males, which may suggest males were chosen over females to be placed in these locations. However, McAnany (1998) gives evidence that during the Late Classic more sites in the Maya region exhibit a fairly equal representation of both males and females in ancestral shrines. Looking at only the Late Classic internments in Gypsy and Tatu, there are three males and two females (Table 2). The ratio is much closer than a combined analysis of Guerra across time (16 males and four females). Therefore, this bias may be more suggestive of a temporal trend than an overall selectivity of males over females. McAnany (1998) also states that the non-elite trend of including more females in ritualistic burials became more pronounced between the Middle and Late Classic. Looking at Guerra, the three Middle Classic burials in Gypsy contain three males and one female, while the Late Classic contain
### Table 2. Age and Sex Distribution Through Time and Social Status

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Site</th>
<th>Status</th>
<th>Male</th>
<th>Female</th>
<th>Unknown Sex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Classic</td>
<td>Tatu</td>
<td>High</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Early Classic</td>
<td>Sara</td>
<td>Low</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Middle Classic</td>
<td>Gypsy</td>
<td>High</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Late Classic</td>
<td>Gypsy</td>
<td>High</td>
<td>3</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Late Classic</td>
<td>Dart</td>
<td>Low</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Late/Terminal Classic</td>
<td>Gypsy</td>
<td>High</td>
<td>6</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Three males and two females. Although the sample size is quite small in comparison, and may just be a coincidence, there is a shift in numbers through the time periods. This shift in Guerra may be reflective of the greater societal trends occurring within the Maya region at the time. Unfortunately the Early Classic burials were heavily affected by taphonomy and a comparison of demography from this period is not possible.

Adults make up the overwhelming majority in this skeletal population (Table 3). Of the 23 individuals only three were non-adults. No infants were recovered from the Guerra community. One of the three non-adult individuals is a child who died around the age of 5-6 years. The other two individuals are subadults, however, while one of these individuals is between the ages of 15-18, the other is actually on the cusp of young adulthood at the age of 17-24 years at the time of death. It is important to note that although these individuals are developmentally young, culturally, they would have been considered adults (Mayes and Barber 2008). The virtual absence of children could be explained by the disappearance of thin, fragile bones over the prolonged period of time, but several infant remains were found at Buenavista, Angel, and Archangel (Black 2007; Mitchell 2006) so this is most likely not the case. In addition, even severe taphonomy can yield the presence of young bones (personal communication, Arion Mayes 2010). A more probable explanation is the selective exclusion of individuals under a certain age group. Uruñuela and Plunket (2002) argue this was practiced, at least during some time periods, in Mesoamerica. Through the absence of dental modification in individuals under the age of 15, Williams and White (2006) suggest Maya individuals may have gone through a rite of passage around this age which only then included them in ritual proceedings. This may have also meant the allowance into lineage internments for ancestral veneration.
An analysis of mortuary practices is possible through the three represented time periods. Every individual buried within the Guerra area was interred in an extended position face down, with the head to the south. Burials at the sub-elite structures of Angel and Archangel in Buenavista del Cayo proper, exhibit both a flex and an extended position, but all the individuals are oriented with the head to the south as well (Black 2007). Welsh (1988) exemplifies the amount of variety in directional orientations within the Maya region and McAnany (1998) explains this as regional preference. This is most likely the case for Buenavist and the suburb Guerra. According to the Maya cosmological beliefs, south is the point at which the sun is at its lowest point (Kunen et al. 2002:208). It is possible there was a connection between the directional significance of south and death for the individuals in this area.

Directionality is also very important in the Maya practices of ancestor veneration. This ritual behavior was, and is, a very large part of Maya ritual and ideology. The Gypsy structure has an east platform (Chuck) where six internments were excavated. In the Maya cosmology east is the connection between the rebirth of the sun, and the rebirth of humans as ancestors (Kunen et al. 2002). Therefore, the placement of this burial platform is significant. In addition, the platform in the Gpsy residential structure is an entryway which is a ritually significant burial location (Webster 1997). Although Vogt (1969) reports that every Maya house has an ancestral shrine, archaeological evidence suggests the household shrines that hold the remains of the ancestors are primarily located within the larger, higher ranking plazuela groups of the community leaders (Yeager and Robin 2004) especially in corporate group pattern communities. Individuals interred in these shrines are lineage leaders who were interred there for the purpose of becoming ancestors. In addition to Gypsy being of high status within the Guerra community, archaeological analysis indicates a good amount of energy was expended for the building and maintenance of Early Classic Tatu, suggesting this

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**Table 3. Age Distribution by Time Period**

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Child</th>
<th>Subadult</th>
<th>Adult</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Classic</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Middle Classic</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Late Classic</td>
<td>1</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Late/Terminal Classic</td>
<td>0</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td>2</td>
<td>20</td>
</tr>
</tbody>
</table>
site housed a wealthy, higher status, non-elite residential group as well (personal communication, Joseph Ball 2009). Therefore, the possible presence of an ancestral internment at this location for the practice of ancestral veneration is not unfounded.

The systematic removal of specific anatomical parts, specifically the skull, hands, and femurs for ancestral veneration is another aspect of this practice (McAnany 1998; Welsh 1988). Some times these elements were kept, for example the adult female in BV84-B3 located in Gypsy was interred without her skull. However, many times these elements were interred with another lineage leader or familial person of great importance. Both the royals of Buenavista and the sub-elites of Angel and Archangel include burials with additional skulls (Black 2007; Mitchell 2006). Two burials within Guerra possess an additional associated skull (BV84-B7 and BV84-B9), and a third contains an extra femur (BV84-B3/B4). Interestingly, there are very few associated grave goods with any of the burials in Guerra, but the burials that do contain cultural material are also the ones that contain extra anatomical elements. The first burial is from the Early Classic structure Tatu (BV84-B9) containing an extra skull, and the other two burials, a Middle Classic (BV84-B7) and a Late Classic (BV84-B3/B4) containing an extra skull and an extra femur respectively, resided within Chuck. All three of these contain an associated obsidian blade. A proposed explanation of this associated blade was that these individuals were sacrifices, which may very well be the case, but the locations of these internments and the pattern also suggest ancestor veneration. The Early Classic burial at Tatu yields the only evidence of an individual being wrapped prior to internment, a practice associated with ancestral veneration (McAnany 1998). In addition, the individual interred during the Middle Classic period exhibits dental modification with two inlays, one hematite and one jade, and a filed incisor. Both hematite and jade holds ritual significance for the Maya. Hematite is a very reflective material and it has been argued that the reflective nature of many stones in Mesoamerica represent portals to the Otherworld (Mayes and Barber 2008). Carlson (1993) gives evidence of a jade mirror, suggesting jade may have been thought of in the same manner as hematite. In addition to this usage, jade was a highly valued, high status material in ancient Mesoamerica and for the Maya (Lange 1993) associated with the growth and development of the maize plant (Miller 1999). The archaeological context, skeletal evidence and associated material culture of this particular burial are highly suggestive of a lineage leader (personal
Though the other burials do not exhibit dental modification, the placement of the internments, associated anatomical elements and an obsidian blade is still a pattern. In addition, several obsidian blade fragments were found in association with the burials of the sub-elite individuals at Angel and Archangel (Black 2007) suggesting status was imbued in this object.

**CONCLUSION**

Even though the demographics of Guerra tend towards a male bias, there is a change from the Middle to Late Classic Gypsy burials to the incorporation of more females in the lineage shrine. More adult individuals are represented in the Guerra internments than subadults and children, and no infants were found at this site. One explanation for the virtual lack of children is the selective internment of young people outside the ancestral shrine (Uruñuela and Plunket 2002). In fact, the only child in this skeletal population was interred in a low status non-elite residential structure which was probably not an ancestor shrine. All the individuals recovered from Guerra were interred extended, prone with their heads to the south. The prevalence of this pattern means this was probably the regional preference for body position. The burial evidence and placement of the internments of high status Gypsy indicate the Chuck platform was an ancestral or lineage shrine. Tatu exhibits similar burial patterning suggesting this higher status non-elite, though not as high as Gypsy, structure may have also contained a lineage shrine in the Early Classic. Three burials, one each from the Early, Middle, and Late Classic exhibit a similar patter of internment with an obsidian blade, a ritual internment location, and an extra skull or femur. These practices indicate ancestor veneration and may signal the ritual practice associated with interring lineage leaders in Guerra.
CHAPTER 5

SKELETAL PATHOLOGICAL ANOMALIES

A fundamental interest of bioarchaeology and paleopathology is human health. The health status of an individual is dependent upon a delicate balance of humankind with disease parasites and environmental stressors (Angle 1981:509). In addition, skeletal pathologies are an amalgamation of physiological strains and the behaviors linked to them through the course of an individual’s life. Disease processes and infection, occupational activities, degenerative changes, and nutritional deprivations can be expressed in skeletal remains. The degree of severity, number, and placement of lesions or abnormal growth indicate what type of pathology it is and how negatively an individual was affected by them during life. However, not all expressions of pathology have a permanently adverse affect. In some cases of disease affliction or nutritional deficiencies an individual with access to certain resources can possess the ability to overcome the stressors placed on them (Mayes and Barber 2008). This chapter deals with the multiple expressions of pathology found in Guerra and their implications for the suburb community as well as the broader implications to the health of the region.

INFECTION: PERIOSTITIS, OSTEOMYELITIS

Periostitis is a generalized infection and may be the result of an array of diseases whose identity may or may not be known. It is the pattern of periostitis presence as well as the boney changes that may be used to diagnose a specific disease or cause. Periostitis, or periostosis, and osteomyelitis are infections as a result of exposure to bacteria from a traumatic lesion, soft tissue infection, or as secondary infections to pre-existing conditions (Aufderheide and Rodriguez-Martin 1998; Ortner 2003); these can occur at any age, on any skeletal element. In adults, most infections are localized on the large cylindrical bones of the appendages (arms and legs; Aufderheide and Rodriguez-Martin 1998). According to Ortner (2003) periosteal reactions are among the most commonly documented skeletal abnormalities in antiquity. These infections can be highly painful, disfiguring, and if bad enough can seriously compromise an individual’s immune system contributing to or causing death.
Periostitis is the infection and inflammation of the outer periostal layer of bone. An uneven layer of woven bone is formed and laid down on the diaphyseal surface as a reaction to the bacterial invasion (Aufderheide and Rodriguez-Martin 1998). Osteomyelitis is a more extensive infection (inflammation) of the inner medullary cavity and outer periostal layer of a bone. The infection produces active local inflammation which results in abscess formation. If the infection becomes extensive, large portions of the bone receive insufficient blood flow forming a layer of dead bone cells. In most cases this layer separates from the original diaphysis creating and exposing abscesses on the new layer and old layer of bone (Aufderheide and Rodriguez-Martin 1998); this can become a more extensive infection and have a more adverse effect on the individual’s health than does localized periostitis.

Iron Deficiency Anemia

Iron is an important nutrient during growth and development because it maintains normal bodily functions and aids the blood in transporting oxygen to the organs. Porotic hyperostosis (labeled as such by Angle 1966) and cribra orbitalia are skeletal responses to an increase in red blood cell destruction. When found on adults, a majority of anemic lesions are either healing or healed (some completely remodeled only exhibiting expanded diploe) with a pronounced number of active porotic hyperostosis and cribra orbitalia found on subadults and children (Aufderheide and Rodriguez-Martin 1998; Lewis 2007). Therefore, these skeletal responses are often an indication of childhood episodes of malnutrition, severe infection, or illness. Cranial elements, specifically the parietal bosses, the occipital squama, and the orbital roof, are affected most often because red blood cells are produced in abundance in the cranium (Aufderheide and Rodriguez-Martin 1998; Larsen 1997; Ortner 2003; Wright 2006).

Porotic hyperostosis is expressed as surface porosity ranging in size from small pinhead-size perforations to larger, several millimeters in circumference. In more pronounced cases the diploë expands with the creation of new bone formation; visibly this new bone has a characteristic “hair on end” pattern observable in radiographs (Wright 2006). Cribra orbitalia shares the same physiological process as porotic hyperostosis, but manifests itself in the eye orbits. Cribra orbitalia usually occurs first, with a later co-occurrence of cranial vault lesions as severity increases (Aufderheide and Rodriguez-Martin 1998; Wright and Chew 1998). As with most pathological conditions, anemia compromises the immune system. It is
not uncommon to find an anemic individual who also has periostitis (Aufderheide and Rodriguez-Martin 1998).

Wright (2006) suggests lesions found on crania in the pre-Hispanic Americas are most likely anemia resulting from iron deficiency in nutritional intake and/or parasitic infection. The sedentary nature of agricultural societies results in a greater exposure to parasites, contributing to a decrease in population health, especially for children (Reinhard 1988, 1990; Reinhard and Bryant 1992). Particularly in populations with a high dietary dependent on maize agriculture, such as the Maya, iron can be severely lacking if the diet is not adequately supplemented with other vitamins and proteins (Hodges 1987; Wright and Chew 1998). Maize contains the chemical phytate which actually inhibits the absorption of iron into the blood stream (Wright 2006). Many Mesoamerican cultures, including the Maya, adapted ways to process maize, or supplement their diet to combat the nutritional deficiencies (Larsen 1997; Wright 2006). Meat in particular is a good iron supplement. These methods, however can still leave young children who’s bodies are not as easily adaptable to nutritional inadequacies at risk as well as those individuals from sociopolitical stratum without access to vital balancing resources.

Wright’s (2006) study on the Pasión Maya revealed a greater number of active lesions in infants and children than adults. She found complete remodeling of cribra orbitalia on old adult cranium which also exhibited healed porotic hyperostosis. In young adults, more females exhibited cribra orbitalia than did males, but males exhibited a much higher rate of porotic hyperostosis. Wright and Chew (1998:927) compiled a number of Maya data sets from the preclassic through the historic periods reporting on the prevalence of porotic hyperostosis in subadults and adults. For the adult samples, there was a definite upsurge in occurrences peaking in the Classic period, which may have contributed to the Maya collapse (Wright and White 1996), with a steady decline from these numbers in the historic period. Even with the declining numbers in later periods, a high rate of anemia is present throughout Mesoamerican history. In fact, according to Wright and Chew (1998) anemia is an ongoing health issue for Central American populations; so much so that the World Health Organization has become involved to try and abate its impact.
MUSCULOSKELETAL STRESS MARKERS AND ENTHESOPATHIES

Repetitive activities undertaken during the course of life leave visible markers at muscle attachment sites, joints, and even in the teeth (Larsen 1997; Mayes 2001; Ortner 2003). Musculoskeletal stress markers (MSM), and enthesopathies are distinct skeletal markings and boney projections that occur at the location where tendons or ligaments insert into the periosteal layer of the bone (Weiss 2003, 2004). The formation of hypertrophic MSM are responses made by the skeleton to its mechanical environment and generally become more pronounced with age (Boyd 1996; Buikstra and Beck 2006; Cardoso and Henderson 2010; Larsen 1997). Age is not the determining factor though, as inter-variation associated with age-at-onset and cause can be exhibited (Ortner 2003).

Determination of specific activities can be difficult without ethnographic data references simply because many activities produce similar morphological changes (Buikstra and Beck 2006; Robb 1998). Cardoso and Henderson (2010) reported that enthesopathy formation was contingent on many factors beyond occupation, such as environment, age-related degeneration, and non-occupationally related activities such as a fall. Generally, males exhibit a greater amount of hypertrophic muscle attachment sites than do women (Weiss 2004), but it has been noted (Aufderheide and Rodriguez-Martin 1998; Larsen 1997; Maggiano et al. 2008; Ortner 2003) that left/right muscle build up are associated with differential use often times associated with gender related activities. In many cases males show an asymmetric preference of upper body use that has been attributed to weapon use or farming activities. On the other hand, females have been recorded as exhibiting bilateral symmetry due to food processing tasks (Aufderheide and Rodriguez-Martin 1998; Larsen 1997). For a considerable period of time certain occupational roles and gender labels have been inseparable. Gender (man and woman) and biological sex (male and female) have been viewed as one-in-the-same in archaeological contexts (Geller 2005; Gustafson and Trevelyan 2002; Inomata et al. 2002). It is, therefore, important to view gender, sex, and labor duties in the context of the society in question. Though some Maya individuals did step outside the defined realm of duties (Miller 1999; Nystrom et al. 2004), the social complexity of the ancient Maya included sexual division of labor duties (Gustafson and Trevelyan 2002).
A study by Maggiano et al. (2008) looking at bone morphology from the ancient Maya community of Xcambo, Yucatan, concluded that there was sexual division of labor for women and men which also translated to status differentiation. Women’s occupational roles included domestic activities such as food processing (Maggiano et al. 2008) wherein they utilized humeri symmetrically when grinding corn with manos and metates. Craft production included the intensive use of phalangies. As a result, females exhibited symmetrical pathological change to the upper long bones and hands (Maggiano et al. 2008). Bolland et al. (2006) collected ethnographic data in a small village in Campeche, Mexico which supports these behaviors and the strenuousness of the activities undertaken on a daily bases by Maya women and their young daughters. According to Bolland et al. (2006) males spend most of their time doing milpa (slash and burn) agriculture which habitually utilizes their back, and leg muscles. The wheel was not a part of ancient Maya society, or anywhere in the Americas, so males had to carry their goods in order to transport them home or for trade (Maggiano et al. 2008). As a result, males exhibited a great degree of lumbar region pathology and lower limb bone robusticity.

**Degenerative Joint Disease**

Degenerative joint disease (DJD), more commonly referred to as osteoarthritis, is a pathology commonly found in antiquity. The onset of DJD is the mechanical wear and tear of the joints as a result of physical activity over time. Sometimes, early onset arthritis can be the result of a traumatic lesion, or a growth deformation (Larsen 1997). These boney changes are diagnosed by the presence of hypertrophic peripheral osteophytes and boney spicules, surface porosity, and in extreme cases either ebernation (bone-on-bone contact) or ankylosis (fusion) of the joint (Bridges 1992; Ortner 2003). The spine is a very common location for arthritis, though synovial (movable) joints, for example at the hip and knee, frequently exhibit pathological changes. Because the form of the bone is changed through repetitive use, the joint most frequently utilized, or nearest a traumatic lesion, will exhibit the most arthritic degeneration (Bridges 1992; Trinkaus and Zimmerman 1982). Hard manual labor and rough terrain increase the frequency of these degenerative changes. The individuals in this study probably encountered both of these factors and will, therefore, express enthesopathies and DJD.
Robb (1998) suggests that an analysis of MSM and arthritic patterns can be used to interpret the differences, if any, between social groups and sexes within a population. Maggiano et al. (2008) found patterning suggesting the community of Xcambo, Yucatan underwent a change in sociopolitical organization and sexual division of labor as seen in the skeletal remains. Archaeological evidence from the Late Classic period suggest Xcambo shifted to a more politically centered economy which translated to a less physically demanding life for the community’s high status male inhabitants. Occupational and arthritic markers on male femora decreased, which correlates with sedentary populations who partake in low levels of strenuous activity. Females on the other hand showed no differences between the Early and Late periods, suggesting the political shift did not affect their labor loads in the same way it did males. The authors (Maggiano et al. 2008) suggest this may be the normal breakdown for ancient Maya societies in general, although other osteological cases are limited in number.

**MATERIALS AND METHODS**

The remains being assessed for this thesis were excavated from four different features, or housing structures, Gypsy, Tatu, Dart and Sara all of which date to the Classic Period (AD 200-900). The combination of time, and soil type has left these individuals poorly preserved, severely fragmented, and at varying levels of completeness. The soil in the Maya lowlands can be highly erosive. Both Tatu and Sara were adversely affected by the yellow clay common in the region (Taschek 1984) which left both burials severely eroded and mineralized to the point of crumbling. This severe taphonomy hindered some assessment of pathology for these burials. Thankfully this extreme was not exhibited in the rest of the internments.

Before analysis was undertaken, bones were cleaned and, when possible, reconstructed. For archival purposes, all remains were photographed and described in detail. Individuals in this collection exhibited degenerative joint disease, osteomylytis, periostytis, porotic hyerostosis, porotic hyperostosis, and cribra orbitalia. Pathological change was recorded as “present” or “absent.” When present the bone, size, type of change, and areas affected were recorded according to the standards set by Buikstra and Ubelaker (1994). In addition, a category of active, healing, or healed was assigned to the affected area(s) of each
element. Photographic and descriptive comparisons of the altered portions were made to reference materials such as Ortner (2003), Aufderheide and Rodriguez-Martin (1998), Waldron (2009), and Brothwell and Sandison (1967) for accurate assessments. Radiographic analysis was conducted on some elements to ascertain the extent of the affected area and in the case of porotic hyperostosis, to determine if it was active at the time of death.

RESULTS

Due to the limited presence of skeletal pathology in the Guerra population, the results for indicators of skeletal pathology will be described in detail instead of visualized in a table or assessed statistically. The taphonomic impact on Tatu and Sara makes comparisons of skeletal pathology on the long bones nearly impossible. For this reason, a majority of the results and comparisons come from Gypsy and Dart.

Infection

Five individuals from Gypsy exhibited pathology consistent with periostitis (BV84-B3, B4, B5, B6, and B7). BV84-B3, B5, B6, and B7 all exhibit healed periostitis on the shaft of the fibula. BV84-B4 exhibits active periostitis in the mid shaft of the ribs (Figure 13 and 14). Though the ribs where fragmentary and reconstruction was not possible for all of them, it is clear that more than one rib was actively infected at the time of death. Individual 2 from Dart (BV84-B8) exhibits porosity and woven bone superior to the external auditory meatus extending anteriorly along the zygomatic root of the temporal (Figure 15). Presence of woven bone and porosity are indicative of general infection. There is no evidence of localized trauma on the temporal, so this may have been caused by a soft tissue infection.

Three individuals (BV84-B1, B4 and B7) exhibit what may be early stages of chronic pyogenic (pus creating) osteomyelitis. At this beginning stage the bone exhibits an osteoporotic worm-eaten look (Aufderheide and Rodriguez-Martin 1998:177) which all three individuals exhibit (Figure 16 and 17). In addition to the boney changes, the location of occurrences in the lower leg bones supports the potential for these pathological changes to be the result of early stages of chronic pyogenic osteomyelitis (Aufderheide and Rodriguez-Martin 1998). Later stages result in a periosteal detachment with subperiosteal new bone formation, but the infection in the three individuals in Gypsy have not advanced to
this stage yet. BV84-B1 and BV84-B4 both exhibit this pathological change in the mid shaft of the tibia while BV84-B7 exhibits this pathology on the mid femoral shaft.

One individual (BV84-B2) exhibits pathological changes to the mandible, possibly associated with either osteomyelitis of the jaw or alveolar hyperostosis. The mandibular cortex has expanded, exhibits moderate porosity, and antemortem tooth loss (Figure 18). When osteomyelitis is exhibited in the mandible, there is generally a perforation through the cortex, but in rare cases the bone expands without creating lesions, and follows the course of osteomyelitis found on long bones with periosteal detachment and new bone formation (Aufderheide and Rodriguez-Martin 1998). This mandible does not exhibit pathology
Figure 15. Porosity and woven bone superior to the EAM from BV94-B8.

Figure 16. Lateral view. Possible early onset chronic pyogenic osteomyelitis on tibia from BV84-B1.
consistent with advanced osteomyelitis, but may be in the beginning phases. Another explanation for these pathological changes may be alveolar hyperostosis. Boney changes associated with this pathological condition usually result in a peripheral buttressing effect along the tooth line, but also exhibits expansion of the matrix, porosity, reactive bone resorption, and a weakening of the bone structure (Aufderheide and Rodriguez-Martin 1998). This mandible does not exhibit a weakening of the bone structure, but the matrix has expanded, extensive alveolar resorption has taken place, and moderate porosity is exhibited.
Therefore, this condition is more likely the cause of the pathological changes in this mandible.

**Iron Deficiency Anemia**

Four individuals exhibit healed porotic hyperostosis (two individuals from BV84-B1, B7 Individual 1, and B8 Individual 2). The first three individuals were interred in Gypsy, and the fourth in Dart. BV84-B7 from Gypsy and B8 from Dart exhibit porosity with slight expansion of the along the sutures of the frontal, parietals, and occipital. Burial B7 exhibits complete healing but Individual 2 from B8 has both active and healing porosity. The two individuals from BV84-B1 exhibit porosity, and severe expansion of the occipital (Figure 19). Radiographs of both of these elements were taken to determine if the porotic hyperostosis was active at the time of death, but neither occipital exhibited the characteristic “hair-on-end” formation resulting from new bone growth. From this, it was determined the disease was not active at the time of death. All of the individuals exhibiting porotic hyperostosis are adult males. One adult male individual from BV84-B1 exhibits healed and healing cribra orbitalia in the superior portion of the left eye orbit (Figure 20).

![Figure 19. Expanded diplöe of the occipital from BV84-B1.](image-url)
Musculoskeletal Stress Markers

Six individuals from Gypsy (BV84-B2, B3, B4, and B7) and one from Dart (BV84-B8) exhibit musculoskeletal stress markers. BV84-B2 exhibits a very extensively hypertrophic temporal line on the frontal bone. BV84-3 exhibits hypertrophic muscle markers of the interosseous crests of the radius and fibula. BV84-B4 exhibits highly developed muscle markers on the plantar surface of foot phalanges. BV84-B7 exhibits a hypertrophic MSM inferior to the glenoid fossa on the scapula (Figure 21). The one individual from Dart (BV84-B8) exhibits hypertrophy of muscle sites on the fibular shaft and exhibits built-up hand phalange muscle markers on the palmar surface. Though skeletal elements from Tatu and Sara were severely impacted by taphonomy, both sites exhibited highly developed fibular interosseous crests.

Degenerative Joint Disease

Six individuals from Gypsy (BV84-B1, B2, B4, B6, and B7) exhibit vertebral arthritis, or osteophytosis. These changes primarily occur on the lumbar, with minimal expression on the cervical and thoracic. BV84-B1, adults, and B2, a middle adult male, exhibit a small amount of osteophyte formation on the margins of lumbar bodies and slight
porosity of the centrum surface. Both boney elements exhibit boney spicules in a localized area along the rim. BV84-B1 also exhibits a small amount of osteophyte formation and slight porosity on a cervical centrum. More pronounced arthritic changes are present on three individuals; BV84-B4, a young adult male, B6, an old adult female, and B7 Individual 1, an old adult male. B4 consists of the most complete set of vertebral elements recovered from Guerra. Thoracic 11 through lumbar five on this male exhibit spicule formation on the left side of the inferior and superior margins, as well as compression of the centrum on the left and moderately sized porosity on the centrum surfaces (Figure 22). This individual showed a propensity for the left side which may suggest he was utilizing his left side for strenuous activity more than the right. B6 exhibits a large amount of lipping on the margins of the cervical centrum and one fragment of a lumbar articular facet exhibits circumferential lipping with extensive spicule formation. B7 exhibits extensive lipping and spicule formation on the margins of a lumbar centrum. One individual from Gypsy (BV84-B3) exhibits a single spicule formation on C1 and C2 at the articular surface of the dens and the dens itself (Figure 23).
Additional Pathological Change

A young adult male from Gypsy (BV84-B4) exhibits bowing of both left and right tibial shafts (Figure 24). Neither femurs nor fibulas are bowed, which probably rules out scurvy (Aufderheide and Rodriguez-Martin 1998). The bowing may be caused by a developmental defect wherein the full range of torsion is not reached. Prenatally and sometimes at birth, the tibial shaft is curved in a medial direction. Normally, the shaft rotates laterally rapidly in the first year of life and continues until adulthood when the bone has reached 140° of torsion. However, some individuals, possibly this young man in Gypsy, do
Figure 24. Medially bowed tibial shafts from BV84-B4.

not develop the full range of postnatal lateral torsion and walk in a ‘twined-toe’ manner with their toes turned in (Scheuer and Black 2004:361). This developmental defect is more rare in adults than it is in developing children, but some cases have documented adults exhibiting this lack of external torsion (Scheuer and Black 2004). Because there are no other lower limbs affected with this specific pathological change, it is highly possible that this young adult male walked with his toes turned in.

**DISCUSSION**

The aim of this thesis is to aid in a comprehensive analysis of the ancient Maya individuals who resided within the Mopan-Macal River valley in western Belize. Analyzing boney pathological changes to the skeleton aid in determining the impact of infection and childhood illness, and possible activity patterns within a community. The ability to overcome compromises in health such as iron deficiency anemia and infections relies heavily on access
to the resources necessary to become healthy again and maintain good health, the most important resource being nutrition. Generally with higher status positions comes greater access to resources. The social construction of the suburb community of Guerra is a non-elite corporate group pattern wherein one family held a higher social position and maintained control of the community’s economic endeavors and ritual practices. With an accompanying ancestral shrine, and community banquet area, the family residing within the Gypsy plazuela group probably acted as community leaders, at least during the Middle and Late Classic periods. Archaeological analysis of Tatu reveals a greater amount of energy expenditure for the building and maintenance of this Early Classic site suggesting this family may have been low status wealthy individuals. Evidence from Early Classic Sara and Late Classic Dart suggest these two sites were part of the lower status non-elite group of the community. Therefore, high status Gypsy and Tatu would be expected to have gained greater access to resources.

Overall, the community of Guerra exhibits a moderate rate of minor skeletal pathologies. However, the patterns found in these skeletons may not be indicative of the community as a whole because the individuals available for analysis were recovered from only two of the four sites, Gypsy and Dart. Skeletal remains recovered from Tatu and Sara were highly impacted by taphonomy and a minimal amount of skeletal pathology was observable. Even so, the general lack of severe pathological conditions on the skeletal elements available for observation suggests these individuals were fairly healthy from childhood to adulthood. A main question for this thesis deals with the influence of violent conflict on the life ways of these non-elite individuals. However, no traumatic lesions consistent with violent conflict were found on any boney element. This may be partly attributed to the fragmentary nature of the remains and the inability to identify perimortem trauma, or because the individuals represented in the recovered burials were not partaking in violent conflict.

Periosteal reactions are one of the most commonly documented pathological conditions in antiquity (Ortner 2003) resulting from general infection caused by several factors including localized trauma, soft tissue infection, or as a secondary infection to a pre-existing condition. Periostitis was documented on five individuals, all of who were adults interred within Gypsy. Four individuals (BV84-B3, B5, B6, and B7) exhibited healing and
healed periosteal reactions on the fibular shaft. One young adult male (BV84-B4) exhibited active periostitis on several rib fragments. An adult male individual from Dart (BV84-B8 Individual 2) exhibits porosity and woven bone superior to the external auditory meatus of the temporal which may be a periosteal reaction. There was no indication of localized trauma for any affected element, so it is likely that these changes were caused by an extensive soft tissue infection.

Porotic hyperostosis and cribra orbitalia are associated with childhood iron deficiency anemia (Aufderheide and Rodriguez-Martin 1998). Though dietary substances varied greatly in the Maya region, maize was a widely distributed and heavily consumed food source. Maize is a low iron food source containing chemicals which further inhibit the absorption of iron, therefore, the presence of porotic hyperostosis in many Maya skeletal samples is attributed to the high consumption of maize (Scherer et al. 2007). All of the individuals exhibiting porotic hyperostosis in Guerra were adults from high status Gypsy who possessed the ability to overcome the period of malnourishment or illness. Because of their status position these individuals possessed the ability to access resources necessary to overcome the childhood illnesses. Interestingly though, the individual from lower status Dart who exhibits porotic hyperostosis has healed completely and survived into adulthood as well. This one male had the ability, despite the lower status, to overcome the childhood stressors. This suggests there may have been more continuity between the higher and lower stratum during the Late Classic period for the Guerra community. Dental pathologies also suggest there was a shift sometime between the Middle and Late Classic to more equal access to carbohydrates (maize). However, it is important to note that although these individuals were able to overcome childhood stressors, there is a higher prevalence of iron deficiency anemia within Guerra (n = 5) than in the ruling elites at Buenavista del Cayo and Cahal Pech (n = 1) and the sub-elites at Angel and Archangel (n = 2). Both of these are low rates within elite skeletal samples. The presence of indicators of childhood iron deficiency anemia in at least five of 23 individuals in Guerra suggests this childhood disease was prevalent for the rural community, but was probably less so for the ruling elites and sub-elites residing within the urban center. This suggests that the ruling and sub-elites were consuming a more varied diet and that Guerra relied more heavily on the consumption of maize. Additionally, it shows that social inequality, in relation to resource access, was present in the Western Belize Valley. In
populations dependent on maize, high rates of porotic hyperostosis are almost always present (Larsen 1997; Scherer et al. 2007; Wright 2006; Wright and Chew 1998). Iron is a vital nutrient for the maintenance of normal growth, development, and function of bodily organs in young people. The chemical compounds in the already iron low maize further inhibit the absorption of iron (Scherer et al. 2007) adding to the overall malnourishment of children. Given that this community was involved in agriculture (Ball and Kelsay 1992), the high prevalence of skeletal manifestations from iron deficiency is not surprising. They are also not surprising given the high rates of iron deficiency anemia exhibited in may ancient Maya skeletal samples as well as the increasing issues faced by modern Maya populations (Wright 2006; Wright and Chew 1998).

In addition to maize consumption, parasite loads can add to the low intake of vitamins, thus increasing rates of infection and iron deficiency anemia exhibited in the skeleton. With the shift from hunter-gather to agricultural subsistence, parasite exposure increased with sedentism and large, compact population numbers. An important factor in contracting and spreading parasites in sedentary living is the permanent location and close proximity of the latrine to all individuals in the community (Reinhard 1990). The combination of latrine proximity and population size in agricultural societies allowed for parasites to accumulate, resulting in contamination of food, water, and people and an overall decline in population health (Reinhard 1988). However, Hodges (1987) suggests that although agriculture does increase the rate of parasite infection, health in regions such as Mesoamerica where agriculture was slowly incorporated into dietary intake, were less adversely impacted than regions, such as North America, where agriculture was incorporated quickly. Reinhard (1988) found that behavioral difference between agricultural societies in various geographic regions can result in differing impacts of parasites on population health. Therefore, the dissimilarity of iron deficiency rates between the elites and non-elites of the Western Belize Valley region could be reflective of dietary as well as behavioral variance. Despite a high rate of anemia for the residents of Guerra, all of the individuals who exhibited this pathological change were able to overcome childhood nutritional deficiencies and mature into adults. However, the difference in anemia rates between high and low status shows there was social inequality in relation to resource access.
Arthritis of the vertebra, otherwise known as osteophytosis, is most commonly associated with individuals over the age of 30 and progresses in severity with increased age (Aufderheide and Rodriguez-Martin 1998). Six of the burials exhibiting osteophytosis in Gypsy (BV84-B1, B2, B3, B5, B6, and B7) were adults approximately 30 years of age at the time of death. These individuals expressed slight to pronounced amounts of osteophyte formation and porosity on all types of vertebra. Given their internment within the ancestral shrine of Gypsy and the overall low degree of osteophytosis, these individuals may not have undergone a very strenuous life. Though age and osteophytosis are highly positively correlated, other factors such as repetitive strenuous physical activity, and localized trauma may influence early onset arthritis. A young adult male from Gypsy between the ages of 21 and 24 years at the time of death (BV84-B4) exhibits pronounced osteophyte formation on the left margins and porosity of the centrum surface of T11 through L5. The lower back is commonly affected by osteophytosis because much of the weight bearing occurs in this region of the body. Because the young adult male exhibited lipping on the same side of seven vertebra, either strenuous activity or trauma is likely. Though no trauma was observed, a traumatic even may have taken place early on that affected the usage of the left side for weight bearing causing these boney changes, or this individual undertook repetitive physical activity primarily focused on the left side, such as farming activities. Interestingly, the foot phalanges of this individual exhibit highly developed muscle sites on the plantar surface. Another explanation may be linked to the fact that this individual is also the young adult male who exhibits the bowed tibial shafts. The developmental deformation of walking with the toes turned in may have affected weight bearing on the left and resulted in the formation of osteophytes earlier in life. This is also the same young adult male who possesses active periostitis of the ribs which certainly would have contributed to his overall declined health at a younger age.

Musculoskeletal stress marker size increases with activity patterns and age (Weiss 2003; 2004). Muscle site hypertrophy on the upper limbs are often associated with occupational activities (Maggiano et al. 2008; Robb 1998) whereas hypertrophy of lower limb muscle sites are generally more correlated with age because the primary function of the legs is locomotion (Weiss 2004). In addition to the small amount of osteophytosis at Gypsy, there is only a slight overall expression of musculoskeletal stress markers. This is also
exhibited in the other three sites, though taphonomic processes affected detailed observations at Tatu and Sara. A majority of the muscle hypertrophy was expressed on the lower limbs. One old adult male (BV84-B7 Individual 1) between 50 and 54 years at the time of death exhibited a highly developed muscle site inferior to the glenoid fossa of the scapula suggestive of repetitive use of the upper left shoulder. However, there were no boney changes consistent with osteoarthritis of the glenoid fossa of the scapula. There were no observed differences between males and females within Guerra, though ethnographic and other skeletal data suggests (Maggiano et al. 2008; Vogt 1969) males and female undertook differing occupational roles within the community.

**CONCLUSIONS**

The indicators of skeletal pathology for the individuals residing within the non-elite suburb community of Guerra, Belize give insights into the overall health of the population. Observations were only possible for Middle and Late Classic high status Gypsy and Late Classic low status Dart, so the patterns are not necessarily conclusive for the whole population or for the span of occupation at Guerra. Overall, the health was decent for these individuals. A high rate of childhood anemia is present within Guerra (n = 5) compared to the ruling elites of Buenavista del Cayo and Cahal Pech (n = 1; Mitchell 2006) and the sub-elites of Angel and Archangel (n = 2; Black 2007). The presence of anemia at both the high status (Gypsy) and low status (Dart) non-elite sites suggest there was access to maize by both status groups during the Middle and Late Classic periods. This suggests there was some degree of continuity between social groups in Guerra during the later periods of occupation. General infection is quite prevalent, though each is minor. Both of these are common in populations dependent on agriculture as Guerra was. An important point from this chapter is, in the case of childhood anemia, while the non-elite individuals of Guerra were able to overcome this deficiency and mature into adulthood, a higher rate of anemia in the non-elite community than the elite community means there was social inequality, specifically in relation to resource access in the Western Belize Valley during the Classic period.
CHAPTER 6

DENTAL PATHOLOGY

Teeth are a valuable source of information in archaeological contexts. The dense nature of enamel makes it resilient to taphonomic process which adversely affect other boney elements. In locals such as Mesoamerica where preservation levels are poor, often the primary element remaining for analysis are teeth (Cucina and Tiesler 2003a; White 1988). And unlike bone, teeth do not have the ability to remodel. Once enamel is formed, it cannot be laid down again, which means teeth leave behind a permanent record of the period of an individual’s growth and development. Teeth are also more genetically controlled than any other bone element in the body. As such, a wealth of information pertaining to an individual resides in their dentition including, occupational and dietary habits (attrition rates), and health status (dental pathology). In addition, patterns of attrition and pathology shed light on questions of resource access and social organization. This chapter will address these issues and discuss in detail the dental anomalies and patterns found in Guerra.

DENTAL ATTRITION

Dental attrition is the wearing away of tooth enamel caused by friction between the teeth for either masticatory or occupational purposes (Hillson 1996; Ortner 2003). Hillson (1996) notes there is usually little difference in attrition rates between the left and right sides of the dentition. Lower molars wear at a slightly elevated rate to the upper molars and given the gradation in eruption rates between M1 and M3, the first molar generally exhibits greater wear than the second or third (Hillson 1996). Molnar (1972) notes the rare occurrence of an unworn permanent or even deciduous tooth in antiquity. According to Larsen (1997), the angles and location of wear distinguish between attrition caused by subsistence strategies and those caused by occupational activities. For example, subsistence wear is expressed by symmetrical wearing across a large number of teeth (Larsen 1997), while occupational uses tend to affect localized areas and create odd angles on the enamel (Mayes 2010; Ortner 2003). For example, Larsen (1985) noted distinct groove patterns on the maxillary and
mandibular anterior dentition of a hunter-gather population from the western Great Basin caused by pulling plant roots through the teeth to prepare them to make items such as fishing nets, baskets, or rope. Mayes (2010) notes similar striations also attributed to plant material involvement reporting a complete loss of enamel and noting a polishing effect in addition to striations on the tooth root caused by the extensive usage.

Subsistence strategies heavily affect rates and severity of attrition. For example, hunter-gather populations with tough diets tend to exhibit rapid, even wearing patterns than do agriculturalists whom consume softer, more processed foods and exhibit more oblique wear patterns (Hillson 1996; Larsen 1997; Smith 1984). This pattern difference has to do with what contacts the tooth itself during mastication. Hunter-gather populations actually exhibit the form of wear called abrasion because teeth do not come in contact with each other as they chop or crush down on the tough, fibrous food sources (Larsen 1997). This primary contact with food creates blunting on tooth cusps (Smith 1984). Agricultural populations, on the other hand exhibit dental attrition which is caused by direct tooth-on-tooth contact (Larsen 1997). Because agriculturalists process the foods, they become softer and in doing so the teeth, particularly the molars, come into primary contact with the supporting cusp (lingual cusps of upper molars and buccal cusps of lower molars (Hillson 1996:237) wearing them down more rapidly and creating a cupping, or oblique pattern instead of even wear (Larsen 1997; Smith 1984; Figure 25). However, with this being said, considerable variability still exists between populations utilizing both subsistence strategies (Larsen 1997).

**Dental Pathology: Caries, Antemortem Tooth Loss, Calculus and Abscesses**

Dental pathologies are important for an assessment of oral health. Distribution and number of caries (cavities), abscesses, ante-mortem tooth loss, and alveolar resorption are indicators of compromised health. Severe calculus buildup can add to the amount of caries and antemortem tooth loss present. The term dental caries is often used to represent the lesions found on teeth when in fact, caries are a disease process occurring when organic microbial activity on the tooth surface progresses to the point of destruction of the tooth structure, crown, and/or root (Hillson 1996; Ortner 2003). This process becomes especially prominent when a population, such as the Maya, consumes a diet high in carbohydrates.
(starches and sugars, i.e. maize). Caries can occur on any surface of the teeth, most commonly manifesting themselves between the crevices of cusps on the occlusal surface, and mesial and distal interproximal surfaces between teeth (Figure 26). These areas allow dental plaque, a dense accumulation of micro-organisms on the tooth surface affecting the development of caries (Hillson 1996:254), to easily build up. The presence of dental plaque produces higher concentrations of waste products around the teeth and allows for sugars, brought in by diet or released through the breakdown by bacteria, to produce organic acids which build up resulting in a break down of the tooth surface causing carious lesions (Hillson 1996).

Consisting of mineralized plaque, calculus accumulates and adheres to the surface of the tooth or the root (Figure 27). This adds to the amount of both bacterial and acid exposure endured by the teeth, allowing more opportunities for carie formation. Calculus presence also gives clues to the dietary makeup of a population (Hardy et al. 2009). A greater prevalence of calculus generally means a greater consumption of proteins and carbohydrates (Seidemann and McKillop 2007). Applying this to resource access, differences in the distribution and severity of calculus between high and low status population segments could shed light on
which group was consuming what type of foods; and if there were stigmas put on certain resources making them more highly valued and accessible to a select social group over another.

If calculus buildup is large and carious lesions becomes extensive enough to eat through to the pulp chamber exposing the system to bacteria, inflammation of the surrounding alveolar bone can take place possibly resulting in the premature loss of teeth, otherwise known as antemortem tooth loss (AMTL; Cucina and Tiesler 2003a; Goodman and Martin 2002). Antemortem tooth loss can also be caused by advanced stage of periodontal disease or chronic inflammation extending to the alveolar bone under the gum line (Cucina and Tiesler 2003a).

Widespread inflammation of the alveolar bone can also lead to resorption of the bone itself. Bone can be lost two ways, horizontally and vertically. Horizontal bone loss results in the loss in height of all the boney walls surrounding the tooth and generally occurs on multiple teeth, if not the entire dental arcade. Vertical bone loss is localized to a single tooth or neighboring teeth with the loss of only one boney wall without affecting the others. The first and second maxillary and mandibular molars are affected by alveolar resorption most often which makes sense considering the primary job of these teeth is mastication and are
used more often then other teeth (Hillson 1996; Figure 28). Both types can occur in the same individual and are indicative of advanced periodontal disease (Hildebolt and Molnar 1991). Abscesses occur when pus accumulates in the periapical region of the tooth socket. When the pressure needs to be released the pus can drain through the root canal, but more often a tunnel is formed through the jaw bone which manifests itself primarily on buccal surface (Hillson 1996; Figure 28). Less often abscesses appear on the lingual surface, in the nasal cavity, or in the maxillary sinus (Hillson 1996), which can cause severe systemic infection (Larsen et al. 1991).

**Figure 28. Mandible from BV84-B6 exhibiting horizontal antemortem tooth loss (white arrow) and periapical abscess (black arrow).**

**LINEAR ENAMEL HYPOPLASIA**

Hypoplastic defects of the tooth enamel are a reflection of the health of an individual during the years of growth and development. When the balance between the nutrient supply and bodily functions is out of sync, defects occur (Goodman and Rose 1991). Once formed, enamel is the hardest tissue in the body. Hypoplastic defects a permanent record of childhood episodes of stress. Hypoplasias are formed when there is a stunt in ameloblast formation;
once the individual has recovered from the stressful episode and ameloblasts resume laying down the enamel surface, a noticeable defect remains from which the age of onset can be measured (Goodman and Rose 1990). Hypoplasias can be difficult to discern, but are a permanent record of childhood health and when interpreted correctly can furnish critical information (Goodman and Rose 1990). Deficiencies are expressed as a line, a pit, or a series of pits along the enamel surface, as well as opacities on the surface, or abnormal discolorations (Goodman and Rose 1990, 1991; Hillson 1996; Figure 29).

Figure 29. Linear enamel hypoplasias on maxillary incisors of BV84-B10.

Although it is such a hard tissue when mature, enamel development is relatively sensitive and enamel defects are non-specific indicators of stress (Goodman and Rose 1990). In addition to nutritional status, work load, systemic disease, localized trauma, and hereditary conditions can alter the normal growth rates of a developing child and cause linear enamel hypoplasia formation (Goodman and Armelagos 1985; Goodman and Rose 1990, 1991). Hypoplasias can occur on both permanent and deciduous dentition. Formation of enamel hypoplasias on adult teeth occur before the age of eight when enamel formation is developing (Goodman and Rose 1990). Maxillary central incisors and mandibular canines exhibit the greatest number of defects because they are the most susceptible to stress (Goodman and Rose 1990; Hillson 1996; Mayes 2001). Agrarian centered populations show an increased number of enamel defects around the world because of nutritional deficiencies in diet and other issues stemming from a sedentary life style (Larsen 1997). The first deciduous dentition begins development around six weeks in utero (Scheuer and Black 2004) with the first
formation of enamel hypoplasias found around month five in utero and continue an estimated 10-12 months after birth (Blakey and Armelagos 1985). Mayes and Barber (2008) note that the early development of hypoplasias on deciduous dentition are an indirect link to the health of the mother. Peak age for hypoplastic development for the Maya has reportedly been between the ages of two and four years, coinciding naturally with the period of weaning off breast milk (Wright 1997, 2006). Vogt’s (1969) ethnographic data of the Chiapas Maya documents the weaning age between two to three years of age. These ages overlap with the skeletal data, though this may be more of a coincidence than the universal cause of all hypoplastic defects (Katzenberg and Saunders 1996). Infant, child, and subadult remains are under represented in many Mesoamerican archaeological samples, therefore, hypoplastic defects allow a glimpse into the stressful endeavors of the young people from this area of the world.

**MATERIALS AND METHODS**

The remains being assessed for this thesis were excavated from four different features, or housing structures, Gypsy, Tatu, Dart and Sara all of which date to the Classic Period (AD 200-900). The combination of time, and soil type has left these individuals poorly preserved, severely fragmented, and at varying levels of completeness. The soil in the Maya lowlands can be highly erosive and both Tatu and Sara were affected by the yellow clay in the region (Taschek 1984) which left both burials severely eroded and mineralized to the point of crumbling. However, even with taphonomic disturbance, the teeth were, for the most part, well preserved and I was able to record reliable data. Before analysis was undertaken all the teeth were cleaned with brushes and dental picks. In some cases root sockets in the alveolar bone were present and I was able to record the teeth in the matrix. For archival purposes, all teeth were measured, photographed, and described in detail. Due to the small sample size, every tooth was recorded for development, caries, attrition, calculus formation, and LEH.

**Caries, Attrition, and Calculus**

The number, placement, and severity of caries were recorded for every tooth. I scored carie placement and severity using the system developed by Moore and Corbett (1971) as outlined in *Standards* (Buikstra and Ubelaker 1994). Placement was recorded as occlusal
surface, interproximal surfaces (mesial or distal), cervical caries, root caries (mesial and distal) and large caries (origin undeterminable due to size).

Dental attrition for anterior teeth as well as molars were recorded using the eight point scale developed by Smith (1984). Attrition rates were scored from a 1: unworn to polished or small factes (no dentine exposure) to an 8: severe loss of crown height, breakdown of enamel rim; crown surface takes on shape of roots (Smith 1984:45). In this system, upper and lower molars are scored by the same wear stages whereas premolars, canines, and incisors have separate upper and lower stages.

Calculus formation was scored using the system developed by Brothwell (1981) recording for small amount, moderate amount, and large amount. I also recorded the location of the affected area in which labial/buccal, lingual, medial, and/or distal, or circumferentially was noted.

**Linear Enamel Hypoplasia**

Hypoplastic features were scored as absent, linear horizontal grooves, linear vertical grooves, linear horizontal pits, nonlinear arrays of horizontal pits, single pits, discrete boundary opacity, or diffuse boundary opacity. This determination was carried out through an examination with a magnifying glass, strong overhead light, and descriptions from Goodman and Rose (1990). Linear horizontal grooves were the most commonly observed hypoplasia and were scored for if the groove was a marked horizontal area with a definite decrease in enamel thickness (Goodman and Rose 1990). Location was determined using fine point digital sliding calipers measuring from the midpoint of the labial/buccal cemento-enamel-junction (CEJ) to the most occlusal portion of the hypoplastic defect (Buikstra and Ubelaker 1994; Goodman and Rose 1990). Teeth for which measurement was obstructed by either postmortem damage or calculus presence were noted for exhibiting hypoplasias, but were not included in analysis.

The height of the hypoplasia (from the CEJ to the tip of the crown) was plugged into a regression formula which bases age estimation for defect formation on the developmental stages of specific teeth. The most commonly used regression formula is outlined by Goodman and Rose (1990). However, the ages for crown development differ from population to population. Wright (2006:165) developed a regression formula which more accurately
addresses the crown height of Amerindian populations. Based on the Pasión series, Wright (2006) estimated mandibular canine tooth development to be complete by 4.5 years instead of the 6.5 years postulated by Goodman and Rose (1990) and Massler et al. (1941). As recommended by Goodman and Rose (1990), Wright (2006:164) assumes a constant enamel growth rate. Wright also considers the initial enamel formation in the first year of development to be buried below the cusp, which shortens the observable developmental period. Therefore, the regression formula outlined by Wright (2006:165) was utilized because it was the most appropriate for the individuals in this thesis.

**RESULTS**

A total of 239 teeth were analyzed for this thesis. All 155 teeth from Gypsy, 32 teeth from Tatu, and 15 teeth from Sara were included. For Dart, the 20 deciduous teeth and 21 developing permanent teeth which were not in occlusion, are not included in the tables below so as not to skew the results, will be discussed separately. Therefore, only the 15 teeth belonging to the additional two individuals at Dart are included in the forthcoming analysis.

**Caries**

Of the 239 teeth analyzed, 28.8% (n = 69) exhibited carious lesions. Seventy-one percent (n = 170) of the teeth do not exhibit caries making the caries rate for the Guerra population moderate. Of the teeth affected by caries, 52.2% (n = 36) are molars (Table 4). Premolars exhibit the next highest caries rate, with incisors and canines exhibiting the lowest. The means for carie presence are reported in Table 5. Gypsy and Tatu express the comparable mean number of caries per tooth at 0.316 and 0.312, respectively. Dart exhibits the highest mean with 0.533. Sara exhibits the lowest mean with only 0.133 caries per tooth.

| Table 4. Inter-Frequency of Caries by Tooth Type |
|---------------------------------|----|---|
| All Sites | Affected | n | % |
| Incisors & Canine | 13 | 69 | 18.8 |
| Premolars | 20 | 69 | 29.0 |
| Molars | 36 | 69 | 52.2 |

Table 6 reports the frequency for number of caries per tooth. Gypsy, Tatu, and Dart all exhibit more teeth with only one carious lesion, but Sara shows equal occurrence of teeth
Table 5. Mean Number of Caries Per Tooth By Site

<table>
<thead>
<tr>
<th>Site</th>
<th>Status Level</th>
<th>Time Period</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tatu</td>
<td>High</td>
<td>Early</td>
<td>0.313</td>
</tr>
<tr>
<td>Gyspy</td>
<td>High</td>
<td>Middle-Late</td>
<td>0.316</td>
</tr>
<tr>
<td>Dart</td>
<td>Low</td>
<td>Late</td>
<td>0.533</td>
</tr>
<tr>
<td>Sara</td>
<td>Low</td>
<td>Early</td>
<td>0.133</td>
</tr>
</tbody>
</table>

Table 6. Intra-Frequency of Caries by Tooth Type

<table>
<thead>
<tr>
<th>Tooth Type</th>
<th>Gypsy</th>
<th>Tatu</th>
<th>Dart</th>
<th>Sara</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Affected</td>
<td>n</td>
<td>%</td>
<td>Affected</td>
</tr>
<tr>
<td>Incisors &amp; Canine</td>
<td>12</td>
<td>65</td>
<td>18.5</td>
<td>0</td>
</tr>
<tr>
<td>Premolars</td>
<td>10</td>
<td>43</td>
<td>23.3</td>
<td>5</td>
</tr>
<tr>
<td>Molars</td>
<td>27</td>
<td>47</td>
<td>57.4</td>
<td>5</td>
</tr>
</tbody>
</table>

with one and two caries though only one tooth was present for each occurrence. The presence of teeth with two caries is comparably low between Gypsy and Tatu at 3.8% and 3.1% respectively. Dart exhibits a fairly high rate of 8.1% of teeth with two caries, and is the only site that exhibits four caries in one tooth. Considering the small number of teeth at Sara, one tooth exhibiting two caries is fairly high.

A comparison of tooth type within sites reveals similar results to the overall patterns expressed in Guerra in Table 6 with Dart exhibiting a slightly different occurrence rate. Gypsy exhibits the highest rates of caries presence in molars with 57.4% (n = 27). Premolars were affected 23.3% (n = 10) of the time, and incisors and canines posses the least amount at 18.5% (n = 12). Tatu exhibits equal caries expression for premolars and molars at 38.5% (n = 13 for each) with no canines or incisors affected. For Sara, 40% (n = 5) of the molars present exhibit carious lesions with no expression in either premolar, canines, or incisors. Dart exhibits a slightly different pattern in caries tooth presence. Premolars exhibited the highest rate of dental caries at 38.5%, with molars affected only 20.0% of the time.

Results from the differences in location of caries are reported in Table 7. Caries occurring on the occlusal surface, interproximal distal, and caries too large to determine a point of origin maintain the highest rates for Gypsy, Tatu, and Dart. Comparably, about half of the teeth in Gypsy and Dart exhibiting carious lesions occur on the occlusal surface. Eighty percent of the teeth with caries in Tatu are exhibited on the occlusal surface. Tatu and Gypsy exhibit comparable rates of carious lesions too large to determine a point of origin at
Table 7. Carie Location on Tooth for All Teeth by Site

<table>
<thead>
<tr>
<th>Location</th>
<th>Gypsy</th>
<th>Tatu</th>
<th>Dart</th>
<th>Sara</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Affected</td>
<td>N</td>
<td>%</td>
<td>Affected</td>
</tr>
<tr>
<td>Occlusal</td>
<td>27</td>
<td>49</td>
<td>55.1</td>
<td>8</td>
</tr>
<tr>
<td>Interproximal Mesial</td>
<td>5</td>
<td>49</td>
<td>10.2</td>
<td>0</td>
</tr>
<tr>
<td>Interproximal Distal</td>
<td>10</td>
<td>49</td>
<td>20.4</td>
<td>1</td>
</tr>
<tr>
<td>CEJ Labial/Buccal</td>
<td>4</td>
<td>49</td>
<td>8.2</td>
<td>1</td>
</tr>
<tr>
<td>CEJ Lingual</td>
<td>5</td>
<td>49</td>
<td>10.2</td>
<td>0</td>
</tr>
<tr>
<td>Root Labial/Buccal</td>
<td>1</td>
<td>49</td>
<td>2.0</td>
<td>0</td>
</tr>
<tr>
<td>Root Lingual</td>
<td>1</td>
<td>49</td>
<td>2.0</td>
<td>0</td>
</tr>
<tr>
<td>Root Mesial</td>
<td>0</td>
<td>49</td>
<td>0.0</td>
<td>0</td>
</tr>
<tr>
<td>Large (Origin Undeterminable)</td>
<td>10</td>
<td>49</td>
<td>20.4</td>
<td>2</td>
</tr>
</tbody>
</table>

20%, which is fairly high given the small number of teeth available at each site. Dart exhibits a very high rate of large carious lesions, at 62.5%. This number is especially high given the small sample of teeth, and the fact that the permanent teeth this burial come from only two adults. Sara exhibits a high rate of caries occurrence on the occlusal surface (50%), but equally so for the interproximal mesial, and CEJ lingual locations (50% each). However, only two teeth exhibited carious lesions at Sara, so these numbers may be an exaggerated expression of the actual caries presence.

**Attrition**

For the purposes of this study, dental wear patterns were truncated from Smith’s (1984) eight stage score system of dental wear into the following four categories: (1) Trace (stage 1); (2) Moderate (stages 2-4); (3) Heavy (stages 5-6); and (7) Severe (stages 7-8).

The majority of teeth across all four sites exhibit moderate wear (Table 8, 9 and 10). At Sara, all but one tooth showed moderate wear and that tooth exhibited heavy wear. Very few teeth exhibited trace wear; 13 teeth in Gypsy, four in Tatu and no teeth in Sara. The only teeth to exhibited severe wear were four molars from Gypsy.

In Gypsy, the most heavily worn teeth were the molars, most of which were moderate or heavily worn. None of the 47 molars present exhibited trace wear. Tatu exhibits nearly equal rates of moderate wear across all the teeth present. Within Tatu the premolars exhibit the highest percent of trace wear (23.1%, n = 3). Dart exhibits the heaviest wear in the incisors and canines with equal rates of moderate and heavy wear (23.1%, n = 3 for each of
Table 8. Incisor and Canine Attrition Rates by Site

<table>
<thead>
<tr>
<th></th>
<th>Gypsy</th>
<th>Tatu</th>
<th>Dart</th>
<th>Sara</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Affected</td>
<td>n %</td>
<td>Affected</td>
<td>n %</td>
</tr>
<tr>
<td>Trace (1)</td>
<td>8</td>
<td>65</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Moderate (2-4)</td>
<td>50</td>
<td>65</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Heavy (5-6)</td>
<td>7</td>
<td>65</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Severe (7-8)</td>
<td>0</td>
<td>65</td>
<td>0</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 9. Premolar Attrition Rates by Site

<table>
<thead>
<tr>
<th></th>
<th>Gypsy</th>
<th>Tatu</th>
<th>Dart</th>
<th>Sara</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Affected</td>
<td>n %</td>
<td>Affected</td>
<td>n %</td>
</tr>
<tr>
<td>Trace (1)</td>
<td>5</td>
<td>43</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>Moderate (2-4)</td>
<td>35</td>
<td>43</td>
<td>9</td>
<td>13</td>
</tr>
<tr>
<td>Heavy (5-6)</td>
<td>3</td>
<td>43</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>Severe (7-8)</td>
<td>0</td>
<td>43</td>
<td>0</td>
<td>13</td>
</tr>
</tbody>
</table>

Table 10. Molar Attrition Rates by Site

<table>
<thead>
<tr>
<th></th>
<th>Gypsy</th>
<th>Tatu</th>
<th>Dart</th>
<th>Sara</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Affected</td>
<td>n %</td>
<td>Affected</td>
<td>n %</td>
</tr>
<tr>
<td>Trace (1)</td>
<td>0</td>
<td>47</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>Moderate (2-4)</td>
<td>33</td>
<td>47</td>
<td>12</td>
<td>13</td>
</tr>
<tr>
<td>Heavy (5-6)</td>
<td>10</td>
<td>47</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>Severe (7-8)</td>
<td>4</td>
<td>47</td>
<td>0</td>
<td>13</td>
</tr>
</tbody>
</table>

the teeth present). Sara exhibits nearly equal rates of wear for all tooth types; 100% of incisors and canines (n = 6), and premolars (n = 5) exhibit moderate wear while the molars exhibit slightly more wear with 80% (n = 4) exhibiting moderate amounts, and 20% (n = 1) exhibiting heavy wear.

Linear Enamel Hypoplasia

The frequency of hypoplastic occurrences per tooth are reported in Table 11. These results include the developing permanent teeth of the child at Dart because they possess hypoplastic defects. All but four individuals (BV84-B3, B7 Individuals 1 and 2 and B11) from Gypsy exhibit dental enamel hypoplasias. The female interred in BV84-B3 was buried without her head and the individual in BV84-B11 has only two teeth, both with postmortem damage. The older adult male (Individual 1) from BV84-B7 lost his maxillary central incisors antemortem, and his maxillary right second incisor has a root carie which destroyed
Table 11. Hypoplasia Presence by Tooth

<table>
<thead>
<tr>
<th>Tooth</th>
<th>Gypsy</th>
<th></th>
<th></th>
<th>Tatu</th>
<th></th>
<th></th>
<th>Dart</th>
<th></th>
<th></th>
<th>Sara</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Affected</td>
<td>n</td>
<td>%</td>
<td>Affected</td>
<td>n</td>
<td>%</td>
<td>Affected</td>
<td>n</td>
<td>%</td>
<td>Affected</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>M³</td>
<td>0</td>
<td>7</td>
<td>0.0</td>
<td>0</td>
<td>1</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>2</td>
<td>0.0</td>
</tr>
<tr>
<td>M²</td>
<td>1</td>
<td>7</td>
<td>14.3</td>
<td>0</td>
<td>1</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>M¹</td>
<td>2</td>
<td>14</td>
<td>14.3</td>
<td>0</td>
<td>2</td>
<td>0.0</td>
<td>0</td>
<td>3</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>P²</td>
<td>3</td>
<td>8</td>
<td>37.5</td>
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<td>0.0</td>
<td>0</td>
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<td>0.0</td>
<td>1</td>
<td>1</td>
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<tr>
<td>P¹</td>
<td>3</td>
<td>9</td>
<td>33.3</td>
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<td>0</td>
<td>0.0</td>
<td>0</td>
<td>3</td>
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<td>2</td>
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<td>100.0</td>
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<td>C¹</td>
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<td>12</td>
<td>83.3</td>
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<td>0</td>
<td>1</td>
<td>0.0</td>
<td>1</td>
<td>1</td>
<td>100.0</td>
</tr>
<tr>
<td>I²</td>
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<td>10</td>
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<td>0</td>
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<td>2</td>
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<td>I¹</td>
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<td>85.7</td>
<td>1</td>
<td>2</td>
<td>50.0</td>
<td>2</td>
<td>4</td>
<td>50.0</td>
<td>1</td>
<td>2</td>
<td>50.0</td>
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<tr>
<td>I₁</td>
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<td>2</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>1</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>I₂₂</td>
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<td>0.0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
<td>1</td>
<td>2</td>
<td>50.0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>C₁</td>
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<td>87.5</td>
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<td>1</td>
<td>100.0</td>
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<td>1</td>
<td>0.0</td>
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<tr>
<td>P₁</td>
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<td>14</td>
<td>0.0</td>
<td>0</td>
<td>2</td>
<td>0.0</td>
<td>0</td>
<td>2</td>
<td>0.0</td>
<td>0</td>
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<td>0.0</td>
</tr>
<tr>
<td>P₂</td>
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<td>8</td>
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<td>0</td>
<td>1</td>
<td>0.0</td>
<td>0</td>
<td>3</td>
<td>0.0</td>
<td>1</td>
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<tr>
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<td>14.3</td>
<td>0</td>
<td>3</td>
<td>0.0</td>
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<td>3</td>
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<td>0</td>
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<td>M₂</td>
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<td>4</td>
<td>0.0</td>
<td>0</td>
<td>3</td>
<td>0.0</td>
<td>0</td>
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<td>0.0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>M₃</td>
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<td>0</td>
<td>2</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

The frequency of teeth with multiple hypoplastic defects are reported in Table 12. Gypsy and Tatu were the only two sites to exhibit teeth with multiple hypoplasias. Here, only two were observed in each tooth. For both sites, the maxillary first incisor exhibited the most multiple defects. Compared by time period between the two sites, multiple hypoplastic defects on one tooth are exhibited during the Early and Late Classic, but not the Middle Classic.

Mean ages of linear enamel hypoplasia onset for each site are reported in Table 13. The mean age of onset in the Guerra population as a whole is 3.6 years with stressful episodes being endured between three and five years of age. The only outlier was a Late Classic individual (BV84-B2) who exhibited a hypoplastic defect on the maxillary second molar at the age of 6.8 years. Compared by sites Gypsy and Dart express the same mean age of onset at 3.5 years. Tatu exhibits the lowest age mean of 3.2 years which is more comparable to Gypsy and Dart than to Sara. Sara exhibits the highest mean with 4.1 years as the age of hypoplasia onset.
Table 12. Number and Percent of Teeth with Multiple Hypoplasias

<table>
<thead>
<tr>
<th>Tooth</th>
<th>Gypsy</th>
<th>Tatu</th>
<th>Dart</th>
<th>Sara</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Affected n</td>
<td>%</td>
<td>Affected n</td>
<td>%</td>
</tr>
<tr>
<td>P²</td>
<td>0 8 0.0</td>
<td>0 2 0.0</td>
<td>0 3 0.0</td>
<td>0 1 0.0</td>
</tr>
<tr>
<td>P¹</td>
<td>3 9 33.3</td>
<td>0 0 0.0</td>
<td>0 3 0.0</td>
<td>0 2 0.0</td>
</tr>
<tr>
<td>C¹</td>
<td>2 12 16.7</td>
<td>0 0 0.0</td>
<td>0 1 0.0</td>
<td>0 1 0.0</td>
</tr>
<tr>
<td>I¹</td>
<td>1 10 10.0</td>
<td>0 0 0.0</td>
<td>0 2 0.0</td>
<td>0 1 0.0</td>
</tr>
<tr>
<td>I₂</td>
<td>3 7 42.9</td>
<td>1 2 50.0</td>
<td>0 4 0.0</td>
<td>0 2 0.0</td>
</tr>
<tr>
<td>C₁</td>
<td>0 2 0.0</td>
<td>0 0 0.0</td>
<td>0 1 0.0</td>
<td>0 0 0.0</td>
</tr>
<tr>
<td>I₁</td>
<td>0 7 0.0</td>
<td>0 0 0.0</td>
<td>0 2 0.0</td>
<td>0 0 0.0</td>
</tr>
<tr>
<td>P₁</td>
<td>0 14 0.0</td>
<td>0 2 0.0</td>
<td>0 2 0.0</td>
<td>0 1 0.0</td>
</tr>
<tr>
<td>P₂</td>
<td>0 8 0.0</td>
<td>0 1 0.0</td>
<td>0 3 0.0</td>
<td>0 1 0.0</td>
</tr>
</tbody>
</table>

Table 13. Mean Age of Hypoplasia Onset by Site

<table>
<thead>
<tr>
<th>Site</th>
<th>Status Level</th>
<th>Time</th>
<th>Mean Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tatu</td>
<td>High</td>
<td>Early</td>
<td>3.2</td>
</tr>
<tr>
<td>Gypsy</td>
<td>High</td>
<td>Middle-Late</td>
<td>3.5</td>
</tr>
<tr>
<td>Dart</td>
<td>Low</td>
<td>Late</td>
<td>3.5</td>
</tr>
<tr>
<td>Sara</td>
<td>Low</td>
<td>Early</td>
<td>4.1</td>
</tr>
</tbody>
</table>

When broken down by time period, Early, Middle, and Late (Table 14) the means are more comparable to each other. The Early Classic exhibits the youngest with a mean age of onset at 3.8 years. The Middle Classic mean is 3.9 years, and the Late Classic mean is 4.1 years. A slight shift to an older age of stress episodes seems to have taken place from the Early to the Late Classic, but not by a large margin.

Table 14. Mean Age of Hypoplasia Onset by Time Period

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Classic</td>
<td>3.8</td>
</tr>
<tr>
<td>Middle Classic</td>
<td>3.9</td>
</tr>
<tr>
<td>Late Classic</td>
<td>4.1</td>
</tr>
</tbody>
</table>

Calculus

For the analysis of dental calculus at Dart, only the permanent teeth from the two adults were used because the developing permanent dentition of the child had not erupted and would have skewed the results. Inclusively, calculus build up is small to moderate in Guerra
A small amount of calculus is exhibited most often at 47.3% (n = 78) with a moderate amount present 33.3% (n = 55) of the time. A large amount of calculus is only exhibited 4.2% (n = 7) of the time and was recorded exclusively in individuals of Gypsy.

Table 15. Calculus Presence for All Sites

<table>
<thead>
<tr>
<th>Amount</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>25</td>
<td>15.2</td>
</tr>
<tr>
<td>Small</td>
<td>78</td>
<td>47.3</td>
</tr>
<tr>
<td>Moderate</td>
<td>55</td>
<td>33.3</td>
</tr>
<tr>
<td>Large</td>
<td>7</td>
<td>4.24</td>
</tr>
</tbody>
</table>

Calculus presence by site is presented in Table 16. Severe taphonomic processes prevented extensive analysis of Tatu, where only two of the 32 teeth present could be recorded for calculus. One of these two teeth (50%) exhibited calculus with a moderate amount. Taphonomy also impacted dental assessment of Sara which yielded only three of 15 teeth available for calculus scoring. None of these teeth exhibited calculus buildup. The preservation for both Gypsy and Dart was sufficient enough to allow adequate observations and comparisons between the two sites. Ninety-one percent (n = 133) of the teeth at Gypsy possess calculus. In contrast, 42.9% (n = 6) of the teeth at Dart exhibit calculus buildup. However, the rates of a small amount of calculus presence between the two sites are comparable at 49.3% (n = 72) at Gypsy and 42.9% (n = 6) at Dart. Gypsy exhibits the highest rates of moderate calculus buildup with 37% (n = 54) of the teeth affected. Gypsy is also the only site to exhibit a large amount of calculus build up (4.8% or n = 7) from two Middle Classic burials (BV84-B5 and B6).

Table 16. Calculus Presence by Site

<table>
<thead>
<tr>
<th></th>
<th>Gypsy</th>
<th>Tatu</th>
<th>Dart</th>
<th>Sara</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Affected</td>
<td>N</td>
<td>%</td>
<td>Affected</td>
</tr>
<tr>
<td>None</td>
<td>13</td>
<td>146</td>
<td>8.9</td>
<td>1</td>
</tr>
<tr>
<td>Small</td>
<td>72</td>
<td>146</td>
<td>49.3</td>
<td>0</td>
</tr>
<tr>
<td>Moderate</td>
<td>54</td>
<td>146</td>
<td>37.0</td>
<td>1</td>
</tr>
<tr>
<td>Large</td>
<td>7</td>
<td>146</td>
<td>4.8</td>
<td>0</td>
</tr>
</tbody>
</table>
Periodontal Disease, Abscesses, and Antemortem Tooth Loss

Due to the limited presence of alveolar bone available, the results for indicators of periodontal disease will be described instead of visualized in a table. The taphonomic impact on Tatu and Sara makes comparisons of oral pathology in the alveolar bone limited. Likewise, only one palatine fragment from Dart is present which exhibits active, widespread, moderate sized porosity indicative of periodontal disease. Within Gypsy, five of the 15 individuals recovered exhibit pathology; these five individuals were the only skeletons with associated alveolar bone. All five individuals exhibited palatine porosity (BV84-B2, B5, B6, B7 Individual 1 and B7 Individual 2). The degree of porosity varies between these five individuals. BV84-B2 exhibits slight porosity of the palate. Three show moderate porosity of the palate (B5, B6, and B7 Individual 2). And the last individual (BV84-B7 Individual 1) exhibits extensive porosity. All five individuals exhibit horizontal alveolar resorption. Only three individuals (BV84-B2, B5, and B6) were associated with a mandible, but all three exhibit porosity along the entire mandibular dental arcade and horizontal resorption. BV84-B5 is the only individual with periapical defects. This individual exhibits an abscess on the mandible and a possible second one on the maxilla. Four individuals (BV84-B2, B5, B6, and B7 Individual 1) exhibit healed antemortem tooth loss. BV84-B5 exhibits the loss of both mandibular and maxillary molars. BV84-B6 exhibits loss of the mandibular molars and the maxillary incisors. BV84-B7 Individual 1 exhibits loss of the maxillary incisors.

The Child (BV84-B8 Individual 3)

Results from the deciduous teeth of the child (5-6 years) interred at Dart (BV84-B8 Individual 3) are not included in every aspect of the above analysis because this was the only child recovered in Guerra, but need to be discussed here. All the deciduous teeth are present (20 teeth total), but only 17 teeth are included in this discussion because four were rendered unobservable due to severe postmortem damage. These four were recognizable based on root and crown shape and size, but other observations were not possible. Six of the 17 teeth exhibit carious lesions. Three contain one lesion on the occlusal surface (maxillary left second incisor, mandibular left second molar), and the other three possess lesions too large to determine the point of origin (maxillary right canine, left first molar, and mandibular left first molar). These three have consumed much of the crown, and
some of the root, and two occur in the molars on the left side of the mouth. One tooth (maxillary first molar) may have contained two caries that merged into a very large lesion occurring on the occlusal surface. In addition to the caries rates, eight of these teeth exhibit moderate wear. The maxillary right second incisor exhibits slightly more wear than the others, but is still classified as moderate.

No calculus was observed on the deciduous dentition and the permanent dentition were still developing in their alveolar crypts, so no calculus were present on them. The deciduous maxillary right second molar and left first molar exhibit hypoplastic defects. Both of these teeth develop in utero, so these defects are an indicator that the mother was suffering from ill health during pregnancy (Mayes and Barber 2008). A linear enamel hypoplasia is present on the permanent maxillary left central incisor with an age of onset around four years. The combination of defects on the deciduous and permanent dentition probably contributed to the decline in health of this young child during the critical growth and development periods. The severity of the caries on such a young child is also an indicator of the dietary consumption of the individual which was probably maize gruel.

**DISCUSSION**

One of the main questions of this thesis has to do with the overall health of the inhabitants of Guerra and what this means for the social and cultural relationships these individuals maintained during life. Indicators of oral health give valuable insight into these relationships between four the residential sites of Gypsy, Tatu, Dart, and Sara, and those people who resided within them. In particular, this information speaks to the social implications associated with access to resources and the ability to overcome stressful episodes as a child. Though diets varied within the Maya region, maize is considered to be a universal food source (Whittington and Reed 1997a) and this high carbohydrate food source often contributes to the high rates of caries expression, calculus buildup, and indicators of periodontal disease (Larsen 1995). For some Maya locals, access to maize was reserved for the higher status individuals, though patterns have changed over time in certain areas (White 1997; Whittington and Reed 1997a). A similar shift appears to have taken place in Guerra through the course of the Classic period.
Early interpretations of ancient Maya social ranking portrayed a very stark dichotomous relationship between elites and non-elites. However, recent studies have shed light on reality of the multi-tiered social construct just within the non-elite segment of Maya populations (Lohse and Valdez 2004a). The social construction of the suburb community of Guerra is more akin to the non-elite corporate group pattern wherein one family held a higher social position and maintained control of the community’s economic endeavors and ritual practices. With an accompanying ancestral shrine, and community banquate area, the family residing within the Gypsy plazuela group probably acted as Guerra community leaders at least during the Middle and Late Classic periods. Archaeological analysis of Tatu reveals a greater amount of energy expenditure for the building and maintenance of this Early Classic site suggesting this family may have been low status wealthy individuals. Evidence from Early Classic Sara and Late Classic Dart suggest these two sites were part of the lower status non-elite group of the community (personal communication, Joseph Ball 2009).

Observations of the community by time period and social ranking reveals interesting information about diet consumption changes and social divisions. Looking at the Early Classic sites first, Tatu exhibits a higher rate of mean caries per tooth, and greater calculus build up than does Sara. The mean number of caries per teeth for Tatu was 0.312 but for Sara a mean of only 0.133 caries per tooth was exhibited. Taphonomy greatly impacted the observations of calculus for both sites; however, the one tooth for Tatu that possesses calculus exhibits a moderate amount. There is a positive correlation between caries presence and calculus buildup (Cucina and Tiesler 2003a), and though there was only one tooth at Tatu with calculus, the caries rate suggests calculus was present on more than the one tooth during life. None of the teeth for Sara exhibited calculus, which could be a coincidence, but the lower caries rate suggests calculus was not as extensive for this individual than those at Tatu. This difference also suggests the individuals at higher status Tatu were consuming more carbohydrates, or maize, than the individuals in lower status Sara. Several studies have indicated the variability in dietary intake between social groups in the Maya region (Cucina and Tiesler 2003a; White 1997; Whittington and Reed 1997b), so these difference may also be the result of a diet including a higher protein intake for the individuals residing in Sara. Attrition rates are comparable for all tooth types at the two sites so rates of tooth wear do not affect the differences in caries rates. Hypoplastic defects are also different between the two
status groups. Sara exhibits a higher mean age of onset for dental enamel hypoplasias at 4.1 years than does Tatu where the mean of childhood stress is 3.2 years of age. Though hypoplasia formation is not necessarily indicative of stress caused by weaning (Blakey et al. 1994), both osteological and ethonographic studies agree (Vogt 1969; Wright 1997) the common age for weaning in Maya populations is three to four years, which directly coincides with the average age of childhood physiological stress sustained for both higher status Tatu and lower status Sara. One explanation for the higher age exhibited in Sara may be that often times Maya individuals in lower social strata weaned children at older ages because there was a more limited access to food sources and breast milk is readily available nutrients for a growing child (Wright 1997). Interestingly, the only tooth in the Early Classic period exhibiting more than one hypoplastic defect was recovered from higher status Tatu. This individual endured physiological stress around the age of three years then another closer to the age of four years. Therefore, there were differences in the weaning process for these two Early Classic households. Though taphonomy was erosive for the remains in the burials of both sites the enamel was preserved well enough to render reliable observations, so this probably did not impact the difference in hypoplastic recording.

Comparing the later period sites of high status Gypsy and lower status Dart reveals some differing trends from the Early Classic. Lower status Dart exhibits a high mean of 0.533 caries per tooth while higher status Gypsy exhibits a mean of 0.316 caries per tooth. Dart exhibits a higher frequency of teeth with multiple caries and large caries with undeterminable points of origin. However, calculus build up between the sites are very different. Of the teeth in Gypsy, 86.3% exhibit small to moderate amounts of calculus buildup while only 42.9% of the teeth in Dart exhibit calculus at all, and only a small amount of calculus is present on these teeth. It would be expected that higher calculus buildup would be positively correlated with higher caries frequency, but that is not the case here. Calculus presence is affected by multiple factors including behavioral habits related to oral hygiene and degree of abrasive foods consumed (Cucina and Tiesler 2003a). An examination of the attrition rates between the two groups sheds some light on these differences. Gypsy exhibits the greatest amounts of attrition on the teeth that exhibit the highest caries frequency. Meaning, the type of teeth that exhibit the most caries (molars), are also the types of teeth that exhibit the most wear. Additionally, it means that the attrition rate is not faster than the
caries rate because caries are still observable. More than half the caries present occur on the occlusal surface (55.1%, n = 27) which wears off first; therefore, those teeth that are worn the most may not exhibit caries because attrition has obliterated them. Dart on the other hand exhibits lower rates of attrition, and a higher rate of caries occurring on the occlusal surface (75%, n = 6). These findings suggest there was access to carbohydrate rich foods at both sites. However, the difference in attrition rates suggests there was probably a behavioral or other dietary difference between Gypsy and Dart. One of the patios within Gypsy, Fatty Fu, contained a large faunal assemblage suggesting the individuals at Gypsy may have been consuming a diet supplemented with animal proteins; this would account for the lower caries rates. Dietary supplement for a certain group over another is seen in other sites within Mesoamerica (White 1997), so it is not surprising that this would be the case in the Western Belize Valley.

The mean age of dental hypoplasia formation are the same for Gypsy and Dart, which is in contrast the two Early Classic sites that exhibited very different ages. Gypsy and Dart both exhibit a mean age of physiological stressors at 3.5 years. Individuals from both sites endured physiological stressors between three and five years of age which falls around the age of weaning for other Maya populations (Vogt 1969; Wright 1997).

Gypsy and Dart were the only two sites to possess alveolar bone for analysis of indicators of periodontal disease. Dart possesses only one palatine fragment which shows porosity consistent with periodontal disease. More alveolar bone was recovered from Gypsy. Five individuals in Gypsy exhibit pathological changes consistent with periodontal disease including antemortem tooth loss, horizontal alveolar resorption, moderate and sever porosity, and one individual exhibits a mandibular abscess. These changes indicate that the oral health of the individuals was not great. Four of the five individuals with this pathology were middle or old adults, who commonly exhibit poor dental health (Wright 1997). One individual was a sub/young adult at the time of death who exhibits only slight to moderate porosity, but nothing else. This young individual was a member of the high social stratum, so his oral health may not be indicative of the younger community members as a whole; however, these moderate changes would be expected as oral health naturally declines with age (Wright 1997).
In order for enamel hypoplasias to form on the permanent dentition, the stress episode must occur during enamel formation, which is generally before the age of eight (Goodman and Rose 1990). Most dental hypoplasias occur on the anterior dentition (incisors and canines) because these teeth are the most susceptible to stress and have a lower threshold for hypoplastic formation than do the posterior dentition (premolars and molars; Goodman and Rose 1990). Meaning, defects exhibited on posterior teeth, particularly the molars, are indicative of episodes of physiological stress severe enough to cause a growth disturbance on less susceptible enamel at a later age in life. Gypsy is the only site to exhibit hypoplastic defects on the posterior teeth. During the Late Classic period, three first molars and one second molar exhibit hypoplastic defects. The defect on the second molar, from BV84-B2, was formed around the age of 6.8 years. This means one individual during the Late Classic endured a severely stressful episode at an older age than the rest. However, this individual was able to recover and survive into adulthood, which means they had access to the resources to do so. In the broader context of Guerra, this may indicate that individuals underwent greater stressors during the Late Classic period, but not necessarily a decline in health. Wright (1997) observed a similar pattern from individuals in the Pasión River region of Guatemala.

A comparison of all time periods by social ranking indicates the possible changes in social dimensions over time within the Guerra community. The Early Classic period saw a greater difference between the higher and lower status non-elite individuals. While the Middle and Late Classic period exhibits similar patterns between the high and low ranking sites. This is not to say there was not a hierarchical social organization during this time, but the dental pathology indicate there was a shift in resource distribution and overall health from the Early to Late periods among social groups. Interestingly though, both high status sites, Gypsy and Tatu, exhibit similar patterning across time. Gypsy and Tatu exhibit comparable caries per teeth means of 0.316 and 0.312 respectively, despite the time differences. Percents of caries numbers are also comparable. Both sites show around 68% of teeth not affected by caries. Of the teeth exhibiting caries at Gypsy, 27.8% possess one carious lesion. Teeth with one carie at Tatu make up 28.1% of the teeth. Teeth with two caries at Gypsy make up 4% of the teeth and at Tatu, they make up 3.1%. Though recording of calculus build up was limited at Tatu, the moderate amount of calculus is comparable with the high rates of small and
moderate amounts of calculus exhibited in Gypsy. Attrition rates for incisors, canines, and
premolars are similar, though Gypsy exhibits more extensive wear on the molars. These
similar rates in dental pathology suggest there was little change in diet or health for the
higher status individuals between the Early and Late Classic periods.

Comparisons of the lower status individuals across time are somewhat different. Late
Classic Dart exhibits a very high mean caries rate with 0.533 caries per tooth, whereas Early
Classic Sara exhibits a very low mean caries rate with 0.133 caries per tooth. This becomes
more exaggerated when a comparison of caries distribution and number are compared. Dart
exhibits carious lesions on all the dentition, whereas Sara only exhibits caries on the molars.
Dart also exhibits a higher rate of caries number per tooth. Though Sara exhibits one tooth
with two caries, three teeth in Dart exhibit two and one tooth exhibits four caries. In addition,
62.5% of the teeth exhibiting caries at Dart are lesions too large to determine a point of origin
whereas no teeth from Sara exhibit large caries. Attrition rates for both sites are moderate,
which may affect caries observation, but are less likely to. Sara exhibits no calculus build up
whereas 42.9% of the teeth in Dart are affected by a small amount of calculus build up. The
higher rates of caries, and calculus may indicate there was a shift in greater access to
carbohydrate rich food sources, particularly maize, for the lower status individuals in Guerra
sometime between the Middle and Late Classic periods. Hypolasia ages differ in these two
low status sites as well, suggesting a change in childhood stress episodes between the Early
and Late Classic. Sara exhibits a higher mean age of stress episodes around the age of four
years and Dart exhibits a mean age of 3.5 years for hypoplastic defect formation. Again, these
ages fall within the average weaning ages for the Maya (Vogt 1969; Wright 1997), although
Dart exhibits a tooth with multiple linear enamel hypoplasias and Sara does not. These dental
pathological changes support the idea that a greater number of stressors were placed on the
ancient Maya peoples during the Late Classic period (Wright 1997; Wright and Chew 1998).
In this particular non-elite suburb population, a greater access and consumption of maize was
achieved in the Late Classic for the individuals within the lower rungs of the non-elite stratum.
CONCLUSIONS

The dental pathology of the individuals residing in the suburb community of Guerra, Belize shed light on the complex social relationships and interconnectedness of the community. There appears to be a greater divide between higher status and lower-status non-elites within Guerra in the Early Classic period by caries rates, calculus, and hypoplasia age differences. In the Middle and Late Classic, caries rates and calculus buildup indicates there was more access to maize by the lower status non-elites than in the Early Classic. The difference in attrition and caries rates between high status and low status during the Late Classic, while marginal, suggest the high status individuals of Gypsy were probably consuming a maize diet supplemented with animal proteins. A comparable mean age of linear enamel hypoplasias suggest the low and high status groups in the Late Classic were exposed to physiological stressors around the same time in life. These individuals in each group were able to overcome the stressors and survive into adulthood. There appears to be little change in high status health and diet from the Early to the Late Classic, though the presence of hypoplasias on the posterior dentition suggests individuals in the Late Classic endured more severe physiological stressors at a later age than the high status individuals in the Early Classic. These conclusions indicate there may have been more cohesion between high and low status groups in the Late Classic within Guerra than there were in the Early Classic period and that the later periods saw more severe stressors, but not necessarily a decline in overall health.
CHAPTER 7
BIOLOGICAL AFFINITY AND STATUS AS SEEN IN TEETH

As Keith Jacobi (1997:138) puts it, “teeth are not everlasting, but they come close.” For this reason the survivability of teeth even under the poorest taphonomic conditions, such as those in Mesoamerica, has made them a primary focus for bioarchaeological studies for more than a century. Along with being resilient, teeth are also highly controlled by genetics making them an indispensable source of information for conducting studies on biological affinity. A primary focus for this thesis is the relationship between the non-elite individuals of Guerra and those of the higher status sub-elite plazuela groups of Angel and Archangel located within Buenavista del Cayo (Black 2007). For this reason, an analysis of biological affinity as well as social status is vital to understanding this relationship. Teeth are visible elements which makes them a prime location for adornment and expressions of social status. This chapter will discuss methods and application of biological affinity between the individuals of non-elite Guerra and those of sub-elite Angel and Archangel as well as analyze the socioeconomic expression of dental modification within Guerra.

BIOLOGICAL AFFINITY

Teeth are among the most reliable forms for determining biological affinity because they are so genetically controlled. Fossil records show that many morphological features evolve very slowly, making them ideal for determining biological relationships through several generations (Scott and Turner 1988; Turner et al. 1991). Morphological (nonmetric) traits are landmarks on the enamel surface (i.e. extra cusps or grooves between cusps) or root of the tooth. These traits are demonstrated as gradations in expression. Standardized studies of nonmetric dental morphology have been in use, updated, and added to since Ales Hrdlicka’s work on incisal shoveling in the 1920s (Turner et al. 1991). In 1991 Christy Turner and colleagues in the Dental Anthropology Laboratory of Arizona State University developed a more extensive standard for observing morphological variants in permanent
dentition to be used for studies on biological affinity. Not all possible traits were selected for this standard, but the ones that were chosen are the most easily and reliably observed, those that have low sexual dimorphic rates, and traits that evolve slowly (Turner et al. 1991:13).

Metric analysis of dentition has revealed that the physical size of teeth is also controlled by genetics. Tooth length (mesiodistal diameter) and tooth width (buccolingual diameter) are measurable traits which are assessed in dental metric analyses. A study by Cheverud and Buikstra (1982) revealed that tooth metrics were slightly less controlled by genetics than tooth morphology, but not enough to make it an unreliable determinate of biological affinity. However, being only two measurements, Coppa et al. (1998) suggest that tooth size may evolve more quickly than tooth morphology. Tooth size is subject to extrinsic factors such as diet, and physiological stressors (Cucina and Tiesler Blos 2004). A study by Cucina and Tiesler (2003b) found there was not a strong correlation between hypoplasia development (physiological stress) and crown size in Maya populations. In addition, the authors argue that dental metrics used within a population from the same region would show less differences in terms of extrinsic factors because they would have been subject to the similar ones, thus controlling for the variation (Cucina and Tiesler Blos 2004). Therefore, despite the potential limitations, dental metrics can give reliable evidence for biological affinity on a major chronological scale. However, it is important to look at biological affinity data in conjunction with material culture and other indicators pertaining to the social relationships between groups.

**DENTAL MODIFICATION**

But perhaps it’s not good for my teeth to come out--since I am, after all, a lord. My finery is in my teeth--and my eyes.

-Seven Macaw from The Story of the Shooting of Seven Macaw by the Two Boys *Popol Vuh* (The Mayan Book of the Dawn of Life)

Dental modification is a physical manifestation of sociopolitical standing undertaken by both elite and non-elite Maya social groups. Modification of teeth takes skill and a professional mastering of the techniques to do so correctly and safely (Linné 1940). No practical or therapeutic application of dental modification has been found, so it is supposed that its function was primarily aesthetic (Linné 1940; Williams and White 2006). Filings and inlays are the two forms of dental modifications expressed by the Maya. Neither of these
types are mutually exclusive. In fact, one individual in this thesis exhibits both inlay and filing. Within these two forms are a wide variety of expressions (Figure 30). Modifications are primarily located on the maxillary anterior teeth, incisors and canines because they are the most visible (Williams and White 2006). Alteration is less often noted on the premolars; however, one individual in this thesis exhibits an inlay on the maxillary first premolar. Observations from the Spanish Friar Diego de Landa (1941 from Williams and White 2006) reveal that these modifications were practiced by senior women in the community, although this may not be the case for the ancient Maya. Toolkits for filing may have included flint blades and worked bone (Williams and White 2006). Inlays are a trickier procedure. Drills similar to those used for trephination (skull surgery) were probably used to make holes for the insertion of inlays (Romero 1970). Stones were then cemented in the hole either by an adhesive, or snuggly fit so as not to fall out (Linné 1940; Williams and White 2006). Materials for adornment in dental inlays include pyrite, jade, turquoise, hematite, and obsidian (Sweet 1963). Dental filings have been found earliest and were probably practiced first beginning in the Early Preclassic (1400-1000 B.C.) with the introduction of inlays beginning around the Middle Preclassic period (900-600 B.C.; Romero 1970). Both types became most prevalent, and therefore, most popular around A.D. 700-900 during the Late Classic period (Williams and White 2006).

There is little support for elite only practice of dental modification (Williams and White 2006). Romero (1970) found similar frequencies of modification between elite and non-elite groups. Linné (1940:5) brings up an interesting point regarding the matriculation of dental modification when he says “certain culture elements are disseminated through commerce, others through the movements of people, and again other through hearsay”; he goes on to say “you cannot tinker up a filing of this kind simply by hearsay.” This means individuals who exhibit dental modification must have had access to someone who had professional knowledge and skill. Therefore, the expressions of these procedures do indicate a position of power, but the meaning does not seem to be elite versus non-elite. Williams and White (2006) suggest the differences in type may be a distinguishing marker between different social levels within the elite and non-elite sectors and go on to cite a study by Tiesler Blos (2001) in which she argues dental modification is a means of local family, or lineage, organization. Demographically speaking, there does not seem to be a bias between
male and female expression of dental modification, though there does seem to be an age interdiction for individuals under the age of 15 receiving these procedures (Williams and White 2006). López Olivares (1997) suggests dental modification may have been associated with a rite of passage. This may have a social correlation to the appropriate age of internment in the ancestral shrine, since infants and children are largely absent (Uruñuela and Plunket 2002).
Linné (1940) argues that there is no way to determine the motives behind the practice of dental modification; however, the symbolism of these expressions can be discussed. The quote at the beginning of this section was taken from the Quiché Popol Vuh (Tedlock 1996). As such, dental modification is deeply rooted with ritualistic significance for the Maya. Images of various types of dental modifications are seen on ceramics, sculptures, and other iconographic representations throughout Mesoamerica (Linné 1940; Williams and White 2006). A very commonly expressed modification, found in this thesis as well, is that of the “T” shaped teeth of the Sun-God (Linné 1940:13, Figure 31) who is depicted as an iconographic figure in the literature as early as 1897 (Gunckel 1897:402). This deity is always depicted with the lateral portions of the maxillary incisors with a filed notch removed and the medial border in tact. Put together, the teeth create a “T”. Several individuals from Chau Hiix and Tipu, Belize exhibit this type of dental modification (Havill et al. 1997). Linné (1940:13) suggests this is meant to resemble the Mayan hieroglyph Ik or “day” meaning air, wind, breath, and the spirit of life. Dental inlay is also found in iconographic texts. A passage from the Popol Vuh describes Lord Seven Macaw as he looses his modified teeth saying “the last of his teeth came out, the jewels that had stood out blue from his mouth” (Tedlock 1996:80). The Mayan hieroglyph for blue also means green (Bricker 1999) which is representative of life and the growth of the maize plant (Miller 1999). Therefore, the colors green and blue held particular ritual and ideological value for the Maya. Jade was a highly valued stone in ancient Mesoamerican culture because of the color (Lange 1993), so jade inlays would most likely have been found on individuals of social importance.

**MATERIALS AND METHODS**

A primary focus of this thesis is biological affinity, therefore, recording of dental morphology followed the extensive sequencing of Turner et al.’s (1991) Arizona State University Dental Anthropology Laboratory (ASU) listing in which a total of 37 discrete dental traits (two to four per tooth) were examined and scored for all teeth present. The corresponding casts were used for comparison as well as the descriptions provided by Turner et al. (1991) to ensure accurate recognition. In some cases dental attrition or taphonomic processes inhibited the scoring of morphological variation; these teeth were not included in statistical analysis. Due to the fragmentary nature of this collection and the limited amount of
associated alveolar bone, traits such as Incisal Winging and Torsomolar were not consistently scored for or available for reliable comparison. Fisher’s Exact Tests with 2 x 2 tables were run comparing each of the four sites (Gypsy, Tatu, Dart and Sara) to each other. Significance was accepted at $p < 0.05$.

In addition I collected metric data on each tooth recording mesiodistal diameters, buccolingual diameters, and crown height, all in millimeters, using digital sliding calipers. Occlusal surfaces obstructed by caries, and teeth exhibiting postmortem damage, or severe calculus presence were excluded from some measurements. Independent Samples Kruskal-Wallis one-way ANOVA statistics were run on all the dental metrics between sites with a significance level of $p < 0.05$ to determine if there was a significant difference between the four sites at Guerra.

For dental modification, Romero’s (1970) chart for Mesoamerican dental modification was used to determine what style the modification resembled. Each tooth with modification was matched to a style, described in detail and photographed.
RESULTS

Two hundred and thirty-nine teeth were available for analysis from all four sites within Guerra. In some cases, attrition, caries, calculus, or postmortem damage prevented observation of tooth morphology and/or dental metrics from being taken. These teeth were not included in the statistical analysis. Because many of the teeth were affected by attrition, only Mesiodistal and Buccolingual measurements were tested, with crown height exclusion.

Biological Affinity within Guerra: Dental Morphology

Given the small sample size in dental morphological traits for Guerra, a Fisher’s Exact Test was used to compare frequency distributions between each site in 2 x 2 tables (contingency tables). Significance was accepted with a $p$ value at 0.05, or a 95% confidence interval. Results from the Fisher’s exact test for dental morphology are represented in Tables 17 and 18. In some cases teeth were too worn or broken and reliable observations could not be made. Statistical tests show a total absence of significant differences when comparing traits between Gypsy, Tatu, Dart and Sara. There is a limitation to the strength of the statistical analysis in some cases, because only one tooth was available for testing, and in others, some sites yielded no teeth for morphological recording. This was especially true in the case of Sara. One individual exhibits a possible Stage 1 (slight expression) talon cusp as defined by Mayes (2007) on the labial surface of the maxillary central incisors. This was the only tooth to exhibit this morphology, but was also a developing permanent tooth from the child recovered from Dart (BV84-B8 Individual 3), so the morphology of this slight expression was more reliably observable.

Biological Affinity within Guerra: Dental Metrics

Given that each of the four sites, Gypsy, Tatu, Dart and Sara, represent an independent sample, a Kruskal-Wallis One-way analysis of variance (ANOVA) test was used to compare the variation in dental measurements between the sites. Significance was accepted with a $p$ value at 0.05, or a 95% confidence interval. There is a limitation to the strength of the statistical analysis at times, because only one tooth was available for testing, and in others, some sites yielded no teeth for measurements. This was especially true in the case of Sara. Only Gypsy exhibited mandibular canines, so statistical tests for dental metrics
### Table 17. Fisher's Exact Test for Maxillary Dental Morphology between Guerra Sites

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<td>2</td>
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<td>1.000</td>
<td>1.000</td>
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<td>1.000</td>
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<td>3</td>
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<td>0.664</td>
<td>0.664</td>
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<td>Hypocone M1-3</td>
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<td>5</td>
<td>3</td>
<td>1</td>
<td>0.529</td>
<td>0.488</td>
<td>0.709</td>
<td>0.696</td>
<td>0.773</td>
<td>0.786</td>
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<td>Cusp 5 M1-3</td>
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<td>0</td>
<td>1</td>
<td>0.638</td>
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<td>2</td>
<td>2</td>
<td>2</td>
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</table>

between sites could not be run for this tooth. A total of 213 measurements for mesiodistal and buccolingual diameters were compared. Results from the Kruskal-Wallis ANOVA test are presented in Table 19. In all statistical analyses for mesiodistal diameter, and buccolingual diameter, only four teeth showed a significant difference in measurement. For mesiodistal diameter, these were the maxillary second incisor with a \( p \) value of 0.019 and the mandibular first molar with a \( p \) value of 0.035. For buccolingual diameter, these were the maxillary first premolar with a \( p \) value of 0.042, and the mandibular first incisor with a \( p \) value of 0.046. Because there is small number of significant differences between each of the four sites within Guerra for dental morphology and metrics, it shows that this community shares close biological affinity.
### Table 18. Fisher's Exact Test for Mabdibular Dental Morphology between Sites

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<td>0</td>
<td>0</td>
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<td>1.000</td>
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<td>0</td>
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<td>0</td>
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<td>-</td>
<td>0.576</td>
<td>0.727</td>
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<td>1</td>
<td>-</td>
<td>0.382</td>
<td>0.646</td>
<td>N/A</td>
<td>0.571</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Groove Pattern X M1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>-</td>
<td>0.618</td>
<td>0.700</td>
<td>N/A</td>
<td>0.571</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Groove Pattern Y M1</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>0.510</td>
<td>0.510</td>
<td>N/A</td>
<td>0.738</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Cusp Number:4 M1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>1.000</td>
<td>1.000</td>
<td>N/A</td>
<td>1.000</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Cusp Number:5 M1</td>
<td>7</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>0.630</td>
<td>0.633</td>
<td>N/A</td>
<td>0.716</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Cusp Number:6 M1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>0.750</td>
<td>0.750</td>
<td>N/A</td>
<td>1.000</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Deflecting Wrinkle M1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>-</td>
<td>0.800</td>
<td>0.629</td>
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<td>0.629</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>DT Crest M1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>1.000</td>
<td>1.000</td>
<td>N/A</td>
<td>1.000</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Protostylid M1</td>
<td>7</td>
<td>2</td>
<td>2</td>
<td>-</td>
<td>0.556</td>
<td>0.556</td>
<td>N/A</td>
<td>0.738</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Cusp 5 M1</td>
<td>5</td>
<td>3</td>
<td>3</td>
<td>-</td>
<td>0.506</td>
<td>0.506</td>
<td>N/A</td>
<td>0.716</td>
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<td>N/A</td>
</tr>
<tr>
<td>Cusp 6 M1</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>0.453</td>
<td>0.453</td>
<td>N/A</td>
<td>1.000</td>
<td>N/A</td>
<td>N/A</td>
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<tr>
<td>Cusp 7 M1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>1.000</td>
<td>1.000</td>
<td>N/A</td>
<td>1.000</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Enamel Extention M1</td>
<td>4</td>
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<td>-</td>
<td>1.000</td>
<td>0.428</td>
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<td>Groove Pattern + M2-3</td>
<td>2</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>0.304</td>
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<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
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<td>Groove Pattern X M2-3</td>
<td>4</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>0.210</td>
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<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
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<tr>
<td>Groove Pattern Y M2-3</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>1.000</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
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<tr>
<td>Cusp Number:4 M2-3</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>-</td>
<td>0.559</td>
<td>0.818</td>
<td>N/A</td>
<td>0.750</td>
<td>N/A</td>
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<tr>
<td>Cusp Number:5 M2-3</td>
<td>6</td>
<td>3</td>
<td>-</td>
<td>1</td>
<td>0.584</td>
<td>0.700</td>
<td>N/A</td>
<td>0.667</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Cusp Number:6 M2-3</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>0</td>
<td>1.000</td>
<td>1.000</td>
<td>N/A</td>
<td>1.000</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Deflecting Wrinkle M2-3</td>
<td>0</td>
<td>2</td>
<td>-</td>
<td>0</td>
<td>0.357</td>
<td>N/A</td>
<td>N/A</td>
<td>1.000</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>DT Crest M2-3</td>
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<td>-</td>
<td>0</td>
<td>0.364</td>
<td>N/A</td>
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<td>N/A</td>
<td>1.000</td>
<td>N/A</td>
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<tr>
<td>Protostylid M2-3</td>
<td>6</td>
<td>2</td>
<td>-</td>
<td>0</td>
<td>0.392</td>
<td>N/A</td>
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<td>N/A</td>
<td>1.000</td>
<td>N/A</td>
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<tr>
<td>Cusp 5 M2-3</td>
<td>7</td>
<td>3</td>
<td>-</td>
<td>1</td>
<td>0.454</td>
<td>0.767</td>
<td>N/A</td>
<td>0.667</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Cusp 6 M2-3</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>0</td>
<td>1.000</td>
<td>N/A</td>
<td>1.000</td>
<td>N/A</td>
<td>1.000</td>
<td>N/A</td>
</tr>
<tr>
<td>Cusp 7 M2-3</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>0</td>
<td>1.000</td>
<td>N/A</td>
<td>1.000</td>
<td>N/A</td>
<td>1.000</td>
<td>N/A</td>
</tr>
<tr>
<td>Enamel Extention M2-3</td>
<td>4</td>
<td>1</td>
<td>-</td>
<td>0</td>
<td>0.641</td>
<td>N/A</td>
<td>1.000</td>
<td>N/A</td>
<td>1.000</td>
<td>N/A</td>
</tr>
</tbody>
</table>

For maxillary first incisors, there were a total of 15 measurements for the mesiodistal diameter and 18 measurements for the buccolingual measurements from Gypsy, Tatu, Dart and Sara. Neither were significant, but approached significance with p values of 0.057 and 0.054, respectively. However, only one tooth was recovered from Sara. A total of six mandibular first incisors were available for mesiodistal diameter measurements and eight buccolingual diameters was available from only two sites, Gypsy and Dart. The mesiodistal
Table 19. Kruskal-Wallis One Way ANOVA Test Result for Dental Morphology Between Sites at Guerra

<table>
<thead>
<tr>
<th>Maxilla</th>
<th>P Value</th>
<th>Mandible</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mesiodistal</td>
<td></td>
<td>Mesiodistal</td>
<td></td>
</tr>
<tr>
<td>I1 MD</td>
<td>0.057</td>
<td>I1 MD</td>
<td>0.064</td>
</tr>
<tr>
<td>I2 MD</td>
<td><strong>0.019</strong></td>
<td>I2 MD</td>
<td>0.346</td>
</tr>
<tr>
<td>C MD</td>
<td>0.076</td>
<td>P1 MD</td>
<td>0.059</td>
</tr>
<tr>
<td>P1 MD</td>
<td>0.426</td>
<td>P2 MD</td>
<td>0.735</td>
</tr>
<tr>
<td>P2 MD</td>
<td>0.082</td>
<td>C MD</td>
<td>N/A</td>
</tr>
<tr>
<td>M1 MD</td>
<td>0.066</td>
<td>M1 MD</td>
<td><strong>0.035</strong></td>
</tr>
<tr>
<td>M2 MD</td>
<td>0.958</td>
<td>M2 MD</td>
<td>0.256</td>
</tr>
<tr>
<td>M3 MD</td>
<td>0.145</td>
<td>M3 MD</td>
<td>0.699</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Buccolingual</th>
<th></th>
<th>Buccolingual</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I1 BL</td>
<td>0.054</td>
<td>I1 BL</td>
<td><strong>0.046</strong></td>
</tr>
<tr>
<td>I2 BL</td>
<td>0.500</td>
<td>I2 BL</td>
<td>1.000</td>
</tr>
<tr>
<td>C BL</td>
<td>0.111</td>
<td>C BL</td>
<td>N/A</td>
</tr>
<tr>
<td>P1 BL</td>
<td><strong>0.042</strong></td>
<td>P1 BL</td>
<td>0.671</td>
</tr>
<tr>
<td>P2 BL</td>
<td>0.315</td>
<td>P2 BL</td>
<td>0.677</td>
</tr>
<tr>
<td>M1 BL</td>
<td>0.125</td>
<td>M1 BL</td>
<td>0.053</td>
</tr>
<tr>
<td>M2 BL</td>
<td>0.140</td>
<td>M2 BL</td>
<td>0.655</td>
</tr>
<tr>
<td>M3 BL</td>
<td>0.398</td>
<td>M3 BL</td>
<td>0.439</td>
</tr>
</tbody>
</table>

measurements were not significant, but the buccolingual measurements were with a $p$ value of 0.046.

For maxillary second incisors, a total of 15 measurements were available for both mesiodistal diameter and buccolingual diameter were available from Gypsy, Dart, and Sara. The mesiodistal diameter showed a statistical significance with a $p$ value of 0.019, but the buccolingual diameter did not. However, this statistical test excludes Tatu. A total of 11 mandibular second incisors were available for mesiodistal diameter and eight for the buccolingual diameter from only Gypsy and Dart. Neither were statistically different between the four sites.

For maxillary canines, a total of 21 mesiodistal measurements and 19 buccolingual measurements were available for statistical testing from Gypsy, Tatu, Dart, and Sara. Neither measurement showed a statistical difference between the four groups. Only Gypsy possessed mandibular canines, so statistical testing between groups could not be run.

For maxillary first premolars, a total of 21 measurements for both mesiodistal diameter and buccolingual diameter were available from Gypsy, Tatu, Dart and Sara. The mesiodistal diameter was not statistically significant but the buccolingual diameter was with a $p$ value of 0.042. A total of 18 mandibular first premolar mesiodistal measurements from Gypsy, Tatu and Dart and 16 buccolingual measurements from all four sites were available.
for statistical analysis. Neither were statistically different, but the mesiodistal diameter approached significance with a $p$ value of 0.059, however, only one tooth was recovered from Tatu for this measurement.

For maxillary second premolars, a total of 20 mesiodistal measurements and 22 buccolingual measurements were available from Gypsy, Tatu, Dart, and Sara. Neither measurement showed statistical significance. A total of 10 mandibular second premolar mesiodistal measurements and 12 buccolingual measurements were available from all four sites. Neither measurement was statistically significant, however, only one tooth was recovered from Sara.

For maxillary first molars, a total of 22 measurements for both mesiodistal diameter and buccolingual diameter were available from Gypsy, Tatu, Dart, and Sara. Neither were statistically significant between all four sites, however, only one tooth was recovered from Sara for these measurements. A total of 16 mandibular first molar mesiodistal measurements from Gypsy, Tatu, and Sara, and 16 buccolingual measurements from all four sites were available. The mesiodistal diameter was statistically significant with a $p$ value of 0.035, however, only three sites were included in analysis. The buccolingual diameter that included all four sites was not statistically different, but approached significance with a $p$ value of 0.053.

For maxillary second molars, a total of 10 mesiodistal measurements and 11 buccolingual measurements were available for statistical testing from Gypsy, Tatu and Dart. Neither were statistically significant, however, Sara was not included in this analysis. A total of eight mandibular second molar measurements for both mesiodistal diameter and buccolingual diameter were available from only Gypsy and Tatu. Neither were statistically significant but Gypsy and Tatu were the only two site with measurements.

For maxillary third molars, a total of nine mesiodistal measurements and 10 buccolingual measurements were available for statistical testing from Gypsy, Tatu, and Sara. Neither were statistically significant but Dart was not included in this analysis. A total of seven mandibular third molar measurements were available for both mesiodistal diameter and buccolingual diameter from only Gypsy and Tatu. Neither were statistically significant but neither Dart or Sara were included in the analysis.
Six mesiodistal measurements were available for comparison between all four sites: maxillary first incisor, maxillary canine, maxillary first and second premolar, maxillary first molar, and mandibular second premolar. The comparisons of the mesiodistal diameter of these teeth between all four sites yielded no statistically significant differences, but the mandibular first incisor did approach significance with a $p$ value of 0.057. Eight buccolingual measurements were available for all four sites: maxillary first incisor, maxillary canine, maxillary first and second premolars, maxillary first and second molars, mandibular first premolar, and mandibular first molar. The comparisons of the buccolingual diameter of these teeth between all four sites showed one statistical difference with the maxillary first premolar at a $p$ value of 0.042. In addition, the mandibular first molar was not significant, but approached significance with a $p$ value of 0.053.

**Dental Modification within Guerra**

Three burials from Gypsy (BV84-B1, B2, and B7) and the burial from Dart (BV84-B8) yielded dental modification. Twelve maxillary teeth from at least six individuals interred in these four burials are modified. Eleven of these are anterior teeth, either canine or incisor, and one is a first premolar. Nine of the teeth, which belong to at least four individuals, exhibit filing and three possess inlays. Of the three inlays, two are hematite and one is jade. Two individuals exhibit the inlays, one who possess jade and hematite in two different teeth. Mesamerican filing styles are exhibited in Figure 30 after Romero’s (1970) classification.

Seven teeth from BV84-B1 are filed, three (two left central incisors and one right central incisor) exhibits the B4 style where the mesial corner is removed creating a notch on one side (Figure 32). The other four teeth (a left canine, a right canine, and paired left and right central incisors) in this burial exhibit style C3 where both mesial and distal corner are removed creating a “T” shape in each tooth (Figure 33). At minimum, three individuals from BV84-B1, all adults, exhibit filed modification because three maxillary left incisors are modified.

One individual, either an adult male or female, from BV84-B2 exhibits the filing style B4 on the maxillary right central incisor. Individual 2 (subadult male) from BV84-B7 shows modification of three teeth and two different styles. The maxillary right central incisor
Figure 32. Maxillary second incisor filed in the B4 style from BV84-B7 Individual 2.

Figure 33. Maxillary central incisors filed in the C3 style forming a “T” shape on each tooth from BV84-B1.
possesses a large hematite inlay in the E3 style (Figure 34), the maxillary left second incisor is filed in the B4 style, and the maxillary right first premolar exhibits a medium sized jade inlay also in the E3 style (Figure 35). One of the adult male individuals from BV84-B8 interred in Dart exhibits a medium sized hematite inlay on the maxillary left central incisor in the E3 style as seen in B7.

![Figure 34. Maxillary first premolar with jade inlay from BV84-B7 Individual 2.](image1)

![Figure 35. Central incisor with hematite inlay from BV84-B7 Individual 2.](image2)

**Biological Affinity between Guerra and Archangel/Angel: Dental Morphology**

Given the small sample size in dental morphological traits for Guerra and Archangel/Angel, a Fisher’s Exact Test was used to compare frequency distributions between each site in 2 x 2 tables (contingency tables). Significance was accepted with a $p$ value at 0.05, or a 95% confidence interval. Additionally, a hierarchical cluster analysis adapted from Scott and Turner (1997) was used to determine biological distance between Guerra and Archangel/Angel and world populations.

Results from the Fisher’s exact test for dental morphology of non-elite Guerra and the Sub-elite group are presented in Tables 20 and 21. In some cases teeth were too worn or
Table 20. Fisher’s Exact Test Results for Maxillary Dental Morphology between Guerra and the Sub-Elite Group

<table>
<thead>
<tr>
<th></th>
<th>Guerra</th>
<th>Sub-Elites</th>
<th>Fisher’s Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labial Curve I1</td>
<td>8</td>
<td>18</td>
<td>0.131</td>
</tr>
<tr>
<td>Shovel I1</td>
<td>17</td>
<td>21</td>
<td>0.447</td>
</tr>
<tr>
<td>Double Shovel I1</td>
<td>9</td>
<td>17</td>
<td>0.102</td>
</tr>
<tr>
<td>Interruption Groove I1</td>
<td>9</td>
<td>3</td>
<td>0.103</td>
</tr>
<tr>
<td>Tuberculum Dentale I1</td>
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<td>1</td>
<td><strong>0.008</strong></td>
</tr>
<tr>
<td>Shovel I2</td>
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</tr>
<tr>
<td>Double Shovel I2</td>
<td>7</td>
<td>13</td>
<td>0.313</td>
</tr>
<tr>
<td>Interruption Groove I2</td>
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<td>6</td>
<td>0.503</td>
</tr>
<tr>
<td>Tuberculum Dentale I2</td>
<td>6</td>
<td>5</td>
<td>0.426</td>
</tr>
<tr>
<td>Shovel C</td>
<td>2</td>
<td>15</td>
<td>0.076</td>
</tr>
<tr>
<td>Double Shovel C</td>
<td>5</td>
<td>15</td>
<td>0.21</td>
</tr>
<tr>
<td>Tuberculum Dentale C</td>
<td>6</td>
<td>8</td>
<td>0.681</td>
</tr>
<tr>
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</tr>
<tr>
<td>Distal Accessory Ridge C</td>
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<td>7</td>
<td>0.591</td>
</tr>
<tr>
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<td>9</td>
<td>0.064</td>
</tr>
<tr>
<td>M &amp; D Cusps P1</td>
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<td>0.077</td>
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<tr>
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</tr>
<tr>
<td>Enamel Extension P1</td>
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<td>0</td>
<td>0.096</td>
</tr>
<tr>
<td>M &amp; D Cusps P2</td>
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<td>0.471</td>
</tr>
<tr>
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<td>0</td>
<td>0.064</td>
</tr>
<tr>
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</tr>
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<td>Hypocone M1-3</td>
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<td>17</td>
<td>0.46</td>
</tr>
<tr>
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<td>0.058</td>
</tr>
<tr>
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</tr>
<tr>
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</tr>
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<td>7</td>
<td>0.178</td>
</tr>
</tbody>
</table>

broken and reliable observations could not be made, and therefore, were not included in statistical analysis. There is a limitation to the strength of the statistical analysis at times, because only one tooth was available for testing, and in others, some sites yielded no teeth for morphological recording. This was especially true in the case of Sara. Statistical tests for dental morphology yielded eight significant differences in exhibition of hereditary traits. On the maxilla, these traits were the presence of a tuberculum dentale on the central incisor, and the presence of a carabelli’s cusp on the maxillary molars. For mandibular dental traits, these were the lingual cusp on the second premolar, the presence of only four cusps on the first molar, the presence of a “Y” groove pattern of the first molar, the presence of six cusps on the first molar, and the presence of six cusps on the second and third mandibular molars.
Table 21. Fisher’s Exact Test Results for Mandibular Dental Morphology between Guerra and the Sub-Elite Group

<table>
<thead>
<tr>
<th>Mandible</th>
<th>Guerra</th>
<th>Sub-Elites</th>
<th>Fisher’s Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distal Accessory Ridge C</td>
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<td>4</td>
<td>0.154</td>
</tr>
<tr>
<td>Lingual Cusp P1</td>
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<td>5</td>
<td>0.388</td>
</tr>
<tr>
<td>Tomes Root P1</td>
<td>7</td>
<td>5</td>
<td>0.642</td>
</tr>
<tr>
<td>Enamel Extension P1</td>
<td>4</td>
<td>0</td>
<td>0.171</td>
</tr>
<tr>
<td>Lingual Cusp P2</td>
<td>4</td>
<td>0</td>
<td>0.023</td>
</tr>
<tr>
<td>Enamel Extension P2</td>
<td>2</td>
<td>0</td>
<td>0.163</td>
</tr>
<tr>
<td>Anterior Fovea M1</td>
<td>2</td>
<td>12</td>
<td>0.287</td>
</tr>
<tr>
<td>Groove Pattern + M1</td>
<td>4</td>
<td>1</td>
<td>0.564</td>
</tr>
<tr>
<td>Groove Pattern X M1</td>
<td>2</td>
<td>0</td>
<td>0.474</td>
</tr>
<tr>
<td>Groove Pattern Y M1</td>
<td>6</td>
<td>6</td>
<td>0.282</td>
</tr>
<tr>
<td>Cusp Number:4 M1</td>
<td>0</td>
<td>6</td>
<td>0.02</td>
</tr>
<tr>
<td>Cusp Number:5 M1</td>
<td>13</td>
<td>7</td>
<td>0.324</td>
</tr>
<tr>
<td>Cusp Number:6 M1</td>
<td>1</td>
<td>3</td>
<td>0.299</td>
</tr>
<tr>
<td>Deflecting Wrinkle M1</td>
<td>4</td>
<td>10</td>
<td>0.45</td>
</tr>
<tr>
<td>DT Crest M1</td>
<td>0</td>
<td>1</td>
<td>0.652</td>
</tr>
<tr>
<td>Protostylid M1</td>
<td>11</td>
<td>6</td>
<td>0.223</td>
</tr>
<tr>
<td>Cusp 5 M1</td>
<td>11</td>
<td>7</td>
<td>0.434</td>
</tr>
<tr>
<td>Cusp 6 M1</td>
<td>3</td>
<td>3</td>
<td>0.608</td>
</tr>
<tr>
<td>Cusp 7 M1</td>
<td>0</td>
<td>0</td>
<td>1.000</td>
</tr>
<tr>
<td>Enamel Extension M1</td>
<td>7</td>
<td>3</td>
<td>0.182</td>
</tr>
<tr>
<td>Groove Pattern + M2-3</td>
<td>6</td>
<td>8</td>
<td>0.435</td>
</tr>
<tr>
<td>Groove Pattern X M2-3</td>
<td>4</td>
<td>1</td>
<td>0.213</td>
</tr>
<tr>
<td>Groove Pattern Y M2-3</td>
<td>0</td>
<td>7</td>
<td>0.013</td>
</tr>
<tr>
<td>Cusp Number:4 M2-3</td>
<td>4</td>
<td>10</td>
<td>0.064</td>
</tr>
<tr>
<td>Cusp Number:5 M2-3</td>
<td>10</td>
<td>7</td>
<td>0.534</td>
</tr>
<tr>
<td>Cusp Number:6 M2-3</td>
<td>0</td>
<td>4</td>
<td>0.047</td>
</tr>
<tr>
<td>Deflecting Wrinkle M2-3</td>
<td>2</td>
<td>9</td>
<td>0.087</td>
</tr>
<tr>
<td>DT Crest M2-3</td>
<td>1</td>
<td>6</td>
<td>0.047</td>
</tr>
<tr>
<td>Protostylid M2-3</td>
<td>8</td>
<td>20</td>
<td>0.063</td>
</tr>
<tr>
<td>Cusp 5 M2-3</td>
<td>10</td>
<td>7</td>
<td>0.509</td>
</tr>
<tr>
<td>Cusp 6 M2-3</td>
<td>0</td>
<td>4</td>
<td>0.055</td>
</tr>
<tr>
<td>Cusp 7 M2-3</td>
<td>0</td>
<td>0</td>
<td>1.000</td>
</tr>
<tr>
<td>Enamel Extension M2-3</td>
<td>5</td>
<td>8</td>
<td>0.439</td>
</tr>
</tbody>
</table>

These results indicate there is variation between these groups, but to a small degree, biological affinity is shared.

In order to further assess the biological distance between the non-elite and sub-elite communities, and compare these communities to world populations, a hierarchical cluster analysis was produced. Scott and Turner (1997) compiled dental morphology data from 21 world populations to determine the biological distance between these groups.

Twenty-three dental traits were compared (see Appendix for a listing of these traits) using the unweighted pair-group method using arithmetic means (UPGMA) to create distance trees or dendrograms. Due to damage to most tooth roots within the Guerra sample,
only crown morphological traits are compared for the distance analysis in this thesis. Therefore, thirteen of the 23 traits outlined by Scott and Turner (1997) could be compared and analyzed. Then, the average linkage of between group (UPGMA) and Euclidean distance statistics were used to determine the biological distance between Guerra and Angel/Archangel to world populations.

The reduction of the total number of dental traits used for comparison and the small sample sizes of Guerra and Angel/Archangel affect the outcome of the dendrogram presented in Figure 36. Small sample sizes tend to inflate the average of specific dental morphological traits making their presence seem greater than they actually are. For this reason the results of the hierarchical cluster analysis should be considered with caution. Neither Guerra nor Angel/Archangel cluster very closely with any world population. Additionally, Guerra and Angel/Archangel do not cluster close to each other; in fact, Angel/Archangel does not cluster with any world population. Black’s (2007:118) hierarchical cluster analysis of Angel, Archangel, and Buenavista/Cahal Pech revealed a similar pattern wherein these groups did not cluster closely with any world population. On the other hand, Guerra clusters more closely with Native American, China-Mongolian and recent Japanese populations. Again, this difference may be explained by the limited amount of data available in comparison to those provided by Scott and Turner (1997). However, the results presented in Figure 36 further suggest that while the individuals of Guerra and Angle/Archangel share some biological affinity, they are not part of the same closely related biological group.

**Biological Affinity between Guerra and Archangel/Angel: Dental Metrics**

Given that each of the three sites, Guerra, Archangel, and Angel, represent independent samples, a Kruskal-Wallis One-way analysis of variance test was used to compare the variation in dental measurements between the sites. Significance was accepted with a $p$ value at 0.05, or a 95% confidence interval. A total of 213 measurements for mesiodistal and buccolingual diameters from Guerra were compared to a total of 145 measurements from Archangel and Angel (Black 2007). There is a limitation to the strength of the statistical analyses at times, because either only one tooth was available for testing or not all the sites yielded teeth available for measurements. This was especially true in the case of Sara and Angel. From Guerra, only Gypsy exhibited mandibular canines, so
statistical tests for dental metrics between the two main population segments are limited for this tooth. Statistical comparisons were run between the non-elite group as a whole, and the sub-elite group as a whole, and between the four non-elite sites within Guerra (Gypsy, Tatu, Dart, and Sara) and the three sub-elite groups of Archangel, Early Classic Angel, and Late Classic Angel (Black 2007). Additionally, statistical analyses were run between Gypsy, Angel and Archangel, and between Gypsy and Angel to determine the analysis of variance between specific groups within this regional population. In the case of statistical comparison between the two independent samples of the non-elite community and the sub-elite
community, and Gypsy and Angel, a Mann-Whitney U Test analysis of variance (ANOVA) was used to compare the variation in dental measurements.

As demonstrated earlier in this chapter, residents of Guerra were found to be biological related to each other. Black (2007) found that the sub-elite community from the sites of Archangel and Angel (Early and Late Classic) within Buenavista del Cayo were also biologically related to each other. Because of the close biological affinity within each community, a statistical comparison was performed between Guerra as a whole, and the sub-elite group as a whole. Results from the Mann-Whitney analysis of variance tests are presented in Table 22. The statistical analysis for mesiodistal diameter and buccolingual diameter for these groups yielded four teeth with a significant difference in measurement. For mesiodistal diameter, this was the maxillary first premolar with a \( p \) value of 0.002. For buccolingual diameter, these were the maxillary first molar with a \( p \) value of 0.033, the second molar with a \( p \) value of 0.026, and the mandibular first incisor with a \( p \) value of 0.029, which indicates the non- and sub-elite communities do share biological affinity.

<table>
<thead>
<tr>
<th>Table 22. Mann-Whitney ANOVA Test for Dental Metrics Compared between the Non-Elite and Sub-Elite Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maxilla</strong></td>
</tr>
<tr>
<td>Mesiodistal</td>
</tr>
<tr>
<td>I1 MD</td>
</tr>
<tr>
<td>I2 MD</td>
</tr>
<tr>
<td>C MD</td>
</tr>
<tr>
<td>P1 MD</td>
</tr>
<tr>
<td>P2 MD</td>
</tr>
<tr>
<td>M1 MD</td>
</tr>
<tr>
<td>M2 MD</td>
</tr>
<tr>
<td>M3 MD</td>
</tr>
<tr>
<td>Buccolingual</td>
</tr>
<tr>
<td>I1 BL</td>
</tr>
<tr>
<td>I2 BL</td>
</tr>
<tr>
<td>C BL</td>
</tr>
<tr>
<td>P1 BL</td>
</tr>
<tr>
<td>P2 BL</td>
</tr>
<tr>
<td>M1 BL</td>
</tr>
<tr>
<td>M2 BL</td>
</tr>
<tr>
<td>M3 BL</td>
</tr>
</tbody>
</table>

A statistical comparison was then performed which analyzed the four sites of Guerra (Gypsy, Tatu, Dart, and Sara) against the three sections of the sub-elite group (Archangel, Early Classic Angel and Late Classic Angel) in order to determine the amount of variation.
between these two segments of the population. Because there were seven groups, a
Kruskal-Wallis ANOVA test was performed for this comparison. Results are shown in Table
23. The analysis for mesiodistal diameter, and buccolingual diameter yielded ten teeth with a
significant difference in measurement. For mesiodistal diameter, these were the maxillary
second incisor with a \( p \) value of 0.035, canine with a \( p \) value of 0.044, first premolar with a
\( p \) value of 0.043, second premolar with a \( p \) value of 0.033, and mandibular first incisor with a
\( p \) value of 0.037, first premolar with a \( p \) value of 0.024, first molar with a \( p \) value of 0.044,
and second molar with a \( p \) value of 0.034. For buccolingual diameter, these were the
maxillary first premolar with a \( p \) value of 0.028, the first molar with a \( p \) value of 0.048.
These results indicate that while non-elite Guerra and sub-elite Angel/Archangel share
biological affinity, there is a high level of variation between the population segments.

Table 23. Kruskal-Wallis ANOVA Tests for Dental Metrics Compared between the
Four Guerra sites, Archangel, Earl Classic Angel, and Late Classic Angel

<table>
<thead>
<tr>
<th>Maxilla</th>
<th>P Value</th>
<th>Mandible</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mesiodistal</td>
<td></td>
<td>Mesiodistal</td>
<td></td>
</tr>
<tr>
<td>I1 MD</td>
<td>0.086</td>
<td>I1 MD</td>
<td>0.151</td>
</tr>
<tr>
<td>I2 MD</td>
<td>\textbf{0.035}</td>
<td>I2 MD</td>
<td>0.670</td>
</tr>
<tr>
<td>C MD</td>
<td>\textbf{0.044}</td>
<td>C MD</td>
<td>0.898</td>
</tr>
<tr>
<td>P1 MD</td>
<td>\textbf{0.043}</td>
<td>P1 MD</td>
<td>\textbf{0.028}</td>
</tr>
<tr>
<td>P2 MD</td>
<td>\textbf{0.033}</td>
<td>P2 MD</td>
<td>0.658</td>
</tr>
<tr>
<td>M1 MD</td>
<td>0.070</td>
<td>M1 MD</td>
<td>\textbf{0.048}</td>
</tr>
<tr>
<td>M2 MD</td>
<td>0.815</td>
<td>M2 MD</td>
<td>0.355</td>
</tr>
<tr>
<td>M3 MD</td>
<td>0.223</td>
<td>M3 MD</td>
<td>0.497</td>
</tr>
<tr>
<td>Buccolingual</td>
<td></td>
<td>Buccolingual</td>
<td></td>
</tr>
<tr>
<td>I1 BL</td>
<td>\textbf{0.037}</td>
<td>I1 BL</td>
<td>0.068</td>
</tr>
<tr>
<td>I2 BL</td>
<td>0.600</td>
<td>I2 BL</td>
<td>0.342</td>
</tr>
<tr>
<td>C BL</td>
<td>0.114</td>
<td>C BL</td>
<td>0.202</td>
</tr>
<tr>
<td>P1 BL</td>
<td>\textbf{0.024}</td>
<td>P1 BL</td>
<td>0.353</td>
</tr>
<tr>
<td>P2 BL</td>
<td>0.380</td>
<td>P2 BL</td>
<td>0.466</td>
</tr>
<tr>
<td>M1 BL</td>
<td>\textbf{0.044}</td>
<td>M1 BL</td>
<td>0.053</td>
</tr>
<tr>
<td>M2 BL</td>
<td>\textbf{0.034}</td>
<td>M2 BL</td>
<td>0.193</td>
</tr>
<tr>
<td>M3 BL</td>
<td>0.419</td>
<td>M3 BL</td>
<td>0.275</td>
</tr>
</tbody>
</table>

Gypsy is the highest status residential dwelling in Guerra. Cultural material found
within the Gypsy structure suggests there was a connection to the sub-elite group,
particularly Angel (personal communication, Joseph Ball), therefore, a Mann-Whitney
statistical test was run to determine the amount of affinity between these two plazuela
groups. Results are reported in Table 24. The comparisons for mesiodistal diameter, and
buccolingual diameter, yielded four teeth with a significant difference in measurement. For
Table 24. Kruskal-Wallis ANOVA Tests for Dental Metrics Compared between Gypsy, Archangel and Angel

<table>
<thead>
<tr>
<th>Maxilla</th>
<th>P Value</th>
<th>Mandible</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mesiodistal</td>
<td></td>
<td>Mesiodistal</td>
<td></td>
</tr>
<tr>
<td>I1 MD</td>
<td>0.238</td>
<td>I1 MD</td>
<td>0.075</td>
</tr>
<tr>
<td>I2 MD</td>
<td>0.070</td>
<td>I2 MD</td>
<td>0.416</td>
</tr>
<tr>
<td>C MD</td>
<td>0.117</td>
<td>C MD</td>
<td>0.767</td>
</tr>
<tr>
<td>P1 MD</td>
<td><strong>0.004</strong></td>
<td>P1 MD</td>
<td>0.069</td>
</tr>
<tr>
<td>P2 MD</td>
<td>0.349</td>
<td>P2 MD</td>
<td>0.639</td>
</tr>
<tr>
<td>M1 MD</td>
<td>0.201</td>
<td>M1 MD</td>
<td>1.000</td>
</tr>
<tr>
<td>M2 MD</td>
<td>0.846</td>
<td>M2 MD</td>
<td>0.303</td>
</tr>
<tr>
<td>M3 MD</td>
<td>0.591</td>
<td>M3 MD</td>
<td>0.461</td>
</tr>
<tr>
<td>Buccolingual</td>
<td></td>
<td>Buccolingual</td>
<td></td>
</tr>
<tr>
<td>I1 BL</td>
<td>0.238</td>
<td>I1 BL</td>
<td>0.089</td>
</tr>
<tr>
<td>I2 BL</td>
<td>0.296</td>
<td>I2 BL</td>
<td>0.087</td>
</tr>
<tr>
<td>C BL</td>
<td>0.090</td>
<td>C BL</td>
<td>0.514</td>
</tr>
<tr>
<td>P1 BL</td>
<td><strong>0.046</strong></td>
<td>P1 BL</td>
<td>0.436</td>
</tr>
<tr>
<td>P2 BL</td>
<td>0.686</td>
<td>P2 BL</td>
<td>0.140</td>
</tr>
<tr>
<td>M1 BL</td>
<td><strong>0.006</strong></td>
<td>M1 BL</td>
<td><strong>0.027</strong></td>
</tr>
<tr>
<td>M2 BL</td>
<td><strong>0.015</strong></td>
<td>M2 BL</td>
<td>0.339</td>
</tr>
<tr>
<td>M3 BL</td>
<td>0.432</td>
<td>M3 BL</td>
<td>0.150</td>
</tr>
</tbody>
</table>

mesiodistal diameter, these were the maxillary first premolar with a $p$ value of 0.004. For buccolingual diameter, these were the maxillary first premolar with a $p$ value of 0.046, first molar with a $p$ value of 0.006, the second molar with a $p$ value of 0.015, and the mandibular first molar with a $p$ value of 0.027. These results indicate Gypsy shares more biological affinity with the sub-elite group than do Tatu, Dart, or Sara.

Archaeological analysis indicates Angel may have had a stronger connection to Gypsy than did Archangel (personal communication, Joseph Ball), therefore, statistical tests were run to see if more affinity existed between these two groups than between Gypsy and the sub-elite community as a whole. Results are presented in Table 25. In the comparisons between Gypsy and Angel for mesiodistal and buccolingual diameter, five teeth exhibited a significant difference in measurement. For mesiodistal diameter these were the maxillary first premolar with a $p$ value of 0.010 and the mandibular first incisor with a $p$ value of 0.050. For buccolingual diameter, these were the maxillary first molar with a $p$ value of 0.038, the mandibular first incisor with a $p$ value of 0.020 and the mandibular second premolar with a $p$ value of 0.039 which indicates Gypsy and Angel do share some biological affinity.
Table 25. Mann-Whitney ANOVA Test for Dental Metrics Compared between Gypsy and Angel

<table>
<thead>
<tr>
<th>Maxilla</th>
<th>P Value</th>
<th>Mandible</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mesiodistal</td>
<td></td>
<td>Mesiodistal</td>
<td></td>
</tr>
<tr>
<td>I1 MD</td>
<td>0.464</td>
<td>I1 MD</td>
<td>0.050</td>
</tr>
<tr>
<td>I2 MD</td>
<td>0.103</td>
<td>I2 MD</td>
<td>0.229</td>
</tr>
<tr>
<td>C MD</td>
<td>0.639</td>
<td>C MD</td>
<td>0.440</td>
</tr>
<tr>
<td>P1 MD</td>
<td>0.010</td>
<td>P1 MD</td>
<td>0.129</td>
</tr>
<tr>
<td>P2 MD</td>
<td>0.739</td>
<td>P2 MD</td>
<td>0.317</td>
</tr>
<tr>
<td>M1 MD</td>
<td>0.149</td>
<td>M1 MD</td>
<td>0.384</td>
</tr>
<tr>
<td>M2 MD</td>
<td>0.881</td>
<td>M2 MD</td>
<td>0.157</td>
</tr>
<tr>
<td>M3 MD</td>
<td>0.827</td>
<td>M3 MD</td>
<td>0.245</td>
</tr>
<tr>
<td>Buccolinguual</td>
<td></td>
<td>Buccolinguual</td>
<td></td>
</tr>
<tr>
<td>I1 BL</td>
<td>0.348</td>
<td>I1 BL</td>
<td>0.020</td>
</tr>
<tr>
<td>I2 BL</td>
<td>0.733</td>
<td>I2 BL</td>
<td>0.071</td>
</tr>
<tr>
<td>C BL</td>
<td>0.079</td>
<td>C BL</td>
<td>0.229</td>
</tr>
<tr>
<td>P1 BL</td>
<td>0.112</td>
<td>P1 BL</td>
<td>0.229</td>
</tr>
<tr>
<td>P2 BL</td>
<td>0.461</td>
<td>P2 BL</td>
<td>0.039</td>
</tr>
<tr>
<td>M1 BL</td>
<td>0.038</td>
<td>M1 BL</td>
<td>0.384</td>
</tr>
<tr>
<td>M2 BL</td>
<td>0.079</td>
<td>M2 BL</td>
<td>0.881</td>
</tr>
<tr>
<td>M3 BL</td>
<td>0.510</td>
<td>M3 BL</td>
<td>0.439</td>
</tr>
</tbody>
</table>

**DISCUSSION**

Early interpretations of ancient Maya social ranking portrayed a very stark dichotomous relationship between elites and non-elites. However, recent studies have shed light on the reality of the multi-tiered social construct just within the non-elite segment of Maya populations (Lohse and Valdez 2004a). The social construction of the suburb community of Guerra is more akin to the non-elite corporate group pattern wherein one family held a higher social position and maintained control of the community’s economic endeavors and ritual practices. With an accompanying ancestral shrine, and community banquet area, the family residing within the Gypsy plazuela group probably acted as Guerra’s community leaders, at least during the Middle and Late Classic periods. Archaeological analysis of Tatu reveals a greater amount of energy expenditure for the building and maintenance of this Early Classic site suggesting this family may have been of low status wealthy individuals. Evidence from Early Classic Sara and Late Classic Dart suggest these two sites were part of the lower status non-elite group of the community (personal communication, Joseph Ball 2009).
Biological Affinity within Guerra

In order to talk about the social relationships between the four sites, Gypsy, Tatu, Dart, and Sara within the community of Guerra, a better understanding of biological relationships between them must be discussed. Both non-metric dental traits (dental morphology) and dental metrics are hereditary (Cucina and Tiesler Blos 2004; Turner et al. 1991). The analysis of these data sources shed light on the biological affinity between the individuals residing within the four residential dwellings of Guerra. Putting together the non-metric and metric statistical analyses, it is clear that there is some variation within the community of Guerra, but overall the individuals recovered by the MMTAP are biologically related to each other. The statistical analysis of dental morphology yielded no statistically significant traits between any of the four sites.

Due to the limited number of teeth, not all sites were included in dental metric statistical analysis. For metric analyses were all four sites were compared, only one statistically significant measurement was found in the buccolingual diameter of the maxillary first premolar with a \( p \) value of 0.042. In the metric tests run between only two sites, this same pattern emerges. Measurements for both mesiodistal and buccolingual diameter for the mandibular first and second incisors, were run only between Late Classic Gypsy and Dart. The buccolingual diameter was statistically significant between these two sites with a \( p \) value of 0.046, but the other three teeth measurements were not. Four measurements including only Late Classic Gypsy and Early Classic Tatu (the mesiodistal measurement for the mandibular second and third molars, and the buccolingual measurement for the mandibular second and third molars) shows no significant differences between these two sites. Dental morphology evolves slowly and is very hereditarily tied (Turner et al. 1991), but tooth size can be more easily affected by outside forces such as diet (Cucina and Tiesler Blos 2004; Scott and Turner 1988). The fact that there was a total absence of statistical significance in dental morphology but there were was some in dental metrics supports the idea that tooth size changes more rapidly, though still slowly, than does dental morphology. Again, this suggests there is normal variation within the Guerra population but overall this is a group of individuals who are biologically related. This also suggests that membership in this community was based on kinship ties of close biological affinity.
Dental Modification and Social Interconnections

Dental modification is a form of cultural expression. For Mesoamerican populations this was an expression of status, but not necessarily the dichotomous status between the elites possessing modification and non-elites exhibiting no modification. As previously stated, there is more variation within the non-elite segment of Maya society than otherwise thought (Lohse and Valdez 2004a). More individuals from non-elite status groups have been found to exhibit dental modification, especially during the Late Classic period when it became a more widespread practice (Williams and White 2006). All of the dental modifications from Guerra come from either the Middle or Late Classic, though only one individual form the Middle Classic exhibits dental modification, and no modification is exhibited at Early Classic Tatu and Sara. Therefore, a majority of the individuals exhibiting dental modification lived and died during the Late Classic. All of the individuals in this collection are around or over the age of 15, which is consistent with the previous data exhibiting a lack of younger Maya individuals with dental modification (Williams and White 2006). One individual (BV84-B7 Individual 2) is a subadult between the ages of 15 and 18 years, but all the other individuals exhibiting modification are adults.

Williams and White (2006) suggest different modification styles, particularly in the Late Classic, may have been a way for the Maya to differentiate lineages or family groups, and were not reserved for only the high status groups. However, the two sites from Guerra, high status Gypsy and lower status Dart exhibit similar dental modifications. Though only one tooth was modified at Late Classic Dart, it was modified with a hematite inlay. This same style of modification was exhibited on only one other individual (BV84-B7 Individual 2) who lived during the Middle Classic period. This similarity suggests some social cohesion during this period which is not surprising given the biological affinity of the community as a whole. The subadult male with the hematite inlay also exhibits a jade inlay and a filed tooth. The jade inlay has specific social connotations because the color green/blue was meant to represent life and the growth of the maize plant (Miller 1999). Garber (1993) suggests that jade is usually found in association with higher status burials. The fact that contextually lower status Dart exhibits a hematite dental inlay does not necessarily suggest that the individuals at Dart were of equal status to the individuals at Gypsy, but by the Late Classic, it is possible that the practice and types of dental
modifications may not have been divided as much by social stratum. Another explanation may be found in the indicators of biological affinity and the patterns of dental pathology. It is clear from the evidence presented above that the individuals form Guerra were biologically related to each other. In addition, dental pathology from this community suggests there was a shift in the Late Classic period to a less divided upper and lower stratum with regards to maize resources. From this evidence, it is possible that Guerra was a more cohesive community during the Late Classic than in earlier periods.

Given the care and precision of the dental modifications recovered at Guerra these individuals had access to people who were practiced in the specialized occupation of dental modification (Linné 1940). This suggests the non-elite community of Guerra possessed a connection, whether biological, social, or both, to the elite communities within Buenavista del Cayo.

**Biological Affinity Between Non-Elite Guerra and Sub-Elite Archangel/Angel**

Based on the statistical comparison of dental metrics and discrete (non-metric) dental traits between non-elite Guerra, and sub-elite Archangel, and Angel, these groups exhibit variation but show some degree of biological affinity. Several statistical analyses were run on metric data to determine the amount of biological similarities and differences existing between the two sub-population segments. Overall, these two social groups are from the same population, as supported by the fact that when the non-elite and sub-elite groups as a whole are compared statistically there are four significant differences, however, when the four sites within Guerra (Gypsy, Tatu, Dart, and Sara) are compared to Archangel, Early Classic Angel and Late Classic Angel, there are ten significant differences in tooth measurement. This discrepancy in significance data may be attributed to the small sample size which exists when each site is split further. Another explanation is the variation within the regional population is more easily seen when each residential compound is analyzed as an independent site than when they are lumped together as one. It is important to note that there is more variation within a population than between populations. Therefore, the significant differences may indicate the normal distribution of variation between communities who are distantly related. Archaeological analysis suggests there was a social connection between Gypsy and the two sub-elite plazuela groups. Statistical comparison of dental metrics
between Gypsy, Archangel and Angel, yielded one more statistically significant difference than the comparison between Gypsy and Angel. This suggests there was in fact shared biological affinity between these particular residential groups.

No rare morphological dental traits were found within either Guerra or Archangel/Angel to help further tease out biological affinity (Mayes 2001; Scott and Turner 1997). However, comparisons of discrete dental traits yield similar results to the metric data discussed above. Statistical analyses revealed seven statistical differences in tooth morphology between Guerra, Archangel, and Angel. One of these traits with a highly significant difference (0.0004) was the expression of a Carabelli’s cusp on the maxillary molars. This trait was not recorded on any individual recovered in either Archangel or Angel, but the trait was recorded for individuals recovered from every site within Guerra. According to Scott and Turner (1997) Carabelli’s cusp is not a trait which can be accurately used for determining familial ties within small population sizes. Meaning, this particular trait is more closely associated with large population determination than small familial groups. All the individuals in Guerra expressed the low-grade Carabelli’s cusp, which is manifested as a pit on the lingual surface. This low-grade expression is expected for the Guerra individuals because it is a commonly found trait in Native American populations (Scott and Turner 1997). This is further supported by the fact that on the hierarchical cluster analysis (Table 23) Guerra clusters more closely with the Native American populations than any other. However, given that there are 13 expressions of the trait in Guerra and none in Archangel or Angel this suggests these two groups may have shared a more distant biological affinity. Shoveling is another trait associated with large population affinity (Scott and Turner 1997). A comparison of maxillary first and second incisal shoveling of Guerra, Archangel, and Angel indicates the expression of this trait is comparable between the non-elite and sub-elite population segments. Again, this is expected given they are both part of the larger Native American population. A combination of the moderate number of statistical differences in both dental morphology and metrics, suggests these two sub-population groups probably shared distant relatives possible associated through marriage.

The interconnections between the ruling elite, sub-elite, and non-elite communities within the Western Belize Valley are more complicated than a simple dichotomy between elite and non-elite population segments. Skeletal analysis completed by Mitchell (2006) and
Black (2007) reveal there was not a definitive biological tie between the ruling elites and the sub-elites. However, in her functional analysis of Archangel and Angel plazuelas, Sandoval (2008) found that both real and fictive kin-relationship existed through cultural ties between these two social groups. Archaeological analysis indicates it is highly probable there was a cultural connection between Gypsy and the ruling elites of Buenavista del Cayo and Cahal Pech (personal communication, Joseph Ball). Gypsy is the only plazuela group in Guerra. The building and maintenance of a plazuela structure requires more energy expenditure, therefore, these structures are associated with higher status families (Ball and Tascheck 1991). A cache found at Gypsy containing two sets of nine and 13 eccentric figurines (Figure 37) identical in content, though not in quality, to another offering found within the higher status center of Buenavista suggests a likely fictive kinship tie between the non-elite high status residence of Gypsy and those of the sub- and ruling elites (Otto 1995).

![Figure 37. Contents of the cache found at Gypsy, identical to the one found at Buenavista. Photo by Joseph Ball.](image-url)

Both metric and non-metric dental traits indicate the non-elite and sub-elite population segments were connected by some biological ties, but were not a homologous familial group. They may have remained bonded through marriage ties which would account for the moderate number of dental differences between these groups. Socially this means
individuals of Guerra may have been afforded the opportunity to achieve a higher status. The directionality of marriage bonds is not part of this analysis, but it is possible that individuals from Guerra were able to gain a higher status through marriage to residents of Angel and Archangel. Membership in each community seems to be based on biological affinity, or kinship. Additionally, a comparison of the material culture found with the two social stratum show similarities. Three burials from the non-elite high status residents of Gypsy and Tatu contain obsidian blades similar to one recovered in a burial at Archangel. Dental modification is similar between Gypsy and Archangel/Angel as well. Two individuals from the sub-elite group exhibit jadite inlays and one tooth has a filed notch on the central incisor (Black 2007). Both of these modification types are found within Guerra. Dental modification takes skill and access to a trained professional (Linné 1940). The ties between the sub-elite community and Guerra explain how several individuals in the non-elite community exhibit both filing and dental inlay modification. These cultural similarities further support the biological affinity revealed by the statistical analyses presented above.

The connection between non-elite Guerra and the ruling elites is less direct. Mitchell (2006) found there was no biological affinity between the two social groups, but an analysis of cultural elements suggests there may have been a social connection. It has been established that there was a strong cultural association between Archangel/Angel and the ruling elites. If Archangel/Angel possessed a biological tie with the residents of Gypsy, an indirect connection to the ruling elites would have existed for Gypsy as well. Given that Guerra is organized in a corporate group pattern where Gypsy functioned as the commanding plazuela group, it is also important to consider the high probability that the ruling elites maintained a connection to Gypsy for agricultural production and distribution purposes (Lohse 2004). A social tie to the ruling elites is further supported by the presence of identical caches found at Gypsy and Buenavista (Otto 1995). Whether the connection was due to one of the reasons previously mentioned, or a combination of them, Gypsy does appear to possess a social association to the ruling elite community as well as biological affinity to the sub-elite residents of Archangel and Angel. Additionally, because each of the three social groups is biologically distinct from the two, but are still tied together, the evidence suggests that kinship, or biological affinity, is the basis for the structure, organization, and membership patterns of these Maya communities.
CONCLUSIONS

Within Guerra, both dental filing and dental inlay are exhibited. A majority of the dental modification from this community comes out of high status Gypsy during Late Classic period which is to be expected given its popularity within this temporal subset (Williams and White 2006). Most of the filing styles exhibit holds ritual significance with the Maya Sun God. One individual from the Middle Classic exhibits both filing and inlay, including a jade inlay which is an elite item with ritual connotations regarding life and growth of the maize plant. The presence of a dental inlay in lower status Late Classic Dart suggest there may have been a shift to a less starkly divided social community during the Late Classic period within Guerra.

The dental morphology and dental metrics of the Guerra community give evidence for biological affinity throughout the occupational period of the site. Though some normal variation is present, the individuals within the community are more alike than they are different. Guerra does not share biological affinity with the ruling elites of Buenavista del Cayo and Cahal Pech, but there does appear to be a social and/or economic tie between them. This is not surprising given that Guerra is organized in a corporate group pattern where some control of agricultural production and distribution lies in the hands of the ruling elites. A statistical comparison of dental metric and non-metric traits between non-elite Guerra and sub-elite Archangel and Angel suggests there was a small degree of biological affinity between the two social strata. However, the individuals of Guerra shared more biological affinity with each other than to the sub-elite group. Similarities in dental modification and grave goods recovered from Guerra, Archangel, and Angel suggest there was a continued social as well as, to a lesser degree, a biological connection between the groups. This suggests that Maya community structure and organization was based on kinship ties, or biological affinity, during the Classic period in the western Belize Valley.
CHAPTER 8

CONCLUDING STATEMENTS

In this study I have assessed various aspects of the non-elite individuals from the suburb community of Guerra (Buenavista del Cayo) in the western Belize Valley in order to gain a better understanding of the lives of these people as well as add to the growing body of knowledge on non-elite Maya life-ways. The four residential dwellings located within Guerra, Gypsy, Tatu, Dart, and Sara, contained burials under analysis for this thesis. Four major questions were the focus of this research (1) To what degree was violent conflict a part of Guerra life as reflected in traumatic lesions? (2) Is the hierarchical ranking of Buenavista and outlying Guerra expressed in the oral health and occupational stress markers? (3) How much of an impact do childhood stressors have on the individuals of Guerra? and (4) Are the non-elite individuals from Guerra related to the higher status sub-elite individuals of Angel and Archangel in Buenavista? As an anthropologist I am interested in what the biology says with regards to cultural aspect of the Guerra community as well. Many recent studies have shown the complexity of the Maya non-elite social stratum (see Lohse and Valdez 2004a). Therefore, in addition to the above mentioned questions, I analyzed the data for patterns associated with social connections which would shed more light on the organization of the non-elite Maya community of Guerra.

No traumatic lesions associated with violent conflict (Lovell 1997) were observed on any boney elements. This may be partly attributed to the fragmentary nature of the remains, but also because the individuals represented in the recovered burials were not partaking in violent conflict. Overall, the skeletal health of the individuals from Guerra is good. There are no severe pathological changes which would have had a permanently adverse affect on any one individual. Small, localized periosteal reactions are the most commonly noted pathology in this population, which is consistent with many ancient skeletal samples (Ortner 2003). The overall oral health of the individuals is moderate. There is a high caries frequency for most of the four sites. By analyzing these frequencies, those of calculus buildup, and hypoplasia age-of-onset through time, there appears to be a greater divide between higher and lower
social strata within Guerra during the Early Classic period (Tatu and Sara) than the Late Classic period (Gypsy and Dart). There are greater differences between the low status groups, Early Classic Sara and Late Classic Dart, suggesting by the Late Classic the low status rung of this non-elite community was consuming more carbohydrate rich foods (maize) than in the earlier period. However, there is little difference between the high status sites, Early Classic Tatu and Middle-Late Classic Gypsy, suggesting there was not a shift in diet or overall health for the high status non-elites of Guerra. During the Late Classic there is evidence of a more varied diet for the residents of high status Gypsy than those of low status Dart. This pattern is consistent with other sites in Mesoamerica at this time (White 1997).

Occupational stress markers were not highly expressed in this community. Most of the expressions were exhibited in the lower limbs and foot phalanges which is normal for human populations (Weiss 2003, 2004). One young adult male (BV84-B4) expressed early onset osteophytosis, but the cause was probably brought on by a growth defect in the tibial shafts causing him to walk with his toes turned in. This young man also exhibits active periostitis of the ribs which may have adversely affected his overall health and contributed to early onset arthritis.

There was a high frequency of childhood stressors for the individuals in this study. Hypoplasia age-of-onset is older in the Late Classic than Early Classic period. In addition, only Late Classic individuals exhibit hypoplastic defects on the posterior dentition (molars) which are less susceptible to stressors affecting the arrest in ameloblast formation (Goodman and Rose 1990). This suggests there were more severe stressors at a later age within the community during the Late Classic period. However, the individuals exhibiting these defects on the posterior teeth were all adults at the time of death, meaning though the stressors may have been more severe, there was not necessarily a decline in overall health as they lived to maturity. Four individuals exhibit porotic hyperostosis and one exhibits cribra orbitalia, both which are indicative of childhood iron deficiency anemia. All five individuals were able to recover from the illness and mature into adults before death. Five individuals affected out of 23 under study is fairly high, though given that the population of Guerra was an agricultural producing group, it is not surprising that iron deficiency was an issue (Scherer 2007). Only a few individuals in the royal elites and sub-elites exhibit these pathological changes (Black 2007; Mitchell 2006) suggesting that childhood stressors did not impact these high status
groups as much as they did Guerra. It important to note that this shows, in terms of access to some resources, there was social inequality within the Western Belize Valley.

The social differences within non-elite Guerra are expressed to a greater degree in the mortuary practices between the residential structures. Three burials, one each from the Early, Middle and Late Classic periods, from high status Tatu and Gypsy all exhibit similar internment styles. The individuals in these burials exhibit an obsidian blade, placement in a ritual location, and an extra anatomical element (skull or femur). This suggests there was a ritual internment practice for particular individuals of elevated social importance. This being said, there is also continuity between the sites for mortuary practices. Every individual was interred extended, and prone (face down), with their head to the south. Welsh (1988) outlines the variety of internment positions exhibited throughout the Maya region, therefore, this must have been the internment preference for this particular community. Though body posture was different for some sub-elite burials, all these individuals were interred with their heads to the south as well. This further supports the notion that this group for ritual, or social reasons, preferred internment with the head to the south.

Variation is always greater within a population than between populations. Though there is much variation in the Guerra community, there is also continuity in behavior and biology. The dental morphology and metric analysis indicates these individuals were biologically related to each other throughout the occupational period of the site. Additionally, dental analyses indicate there was a small degree of biological affinity between non-elite Guerra and sub-elite Archangel and Angel. The continued biological affinity of the two groups suggests Gypsy may have been afforded the opportunity to achieve a higher status, possibly through marriage. Cultural material further indicates that a social connection existed between non-elite Gypsy and the ruling elites of Buenavista del Cayo, most likely for agricultural purposes. The evidence suggests that, because there is a biological distinction between each of the three social strata, kinship, or biological affinity, was the basis for the social structure, organization, and membership patterns of these Maya communities during the Classic period.
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APPENDIX

DENTAL MORPHOLOGICAL TRAITS USED BY
SCOTT AND TURNER (1997)
Dental Morphological Traits Used By Scott and Turner (1997: 322-323)

Winging
Shoveling UI1
Double Shoveling
Interruption Grooves
Bushman’s Canine
Odontomes
3-cusped UM2
Carabelli’s Cusp
Cusp 5 UM1
Enamel Extension
4-cusped LM1
4-cusped LM2
Y pattern LM2
Cusp 6 LM1
Cusp 7 LM1
Deflecting Wrinkle
2-rooted UP1
3-rooted UM2
2-rooted LC
Tomes’ Root
3-rooted LM1
1-rooted LM2
Distal Trigonid Crest