The Bioarchaeology of Social Order: Cooperation and Conflict Among the Mimbres (AD 550-1300)

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THE BIOARCHAEOLOGY OF SOCIAL ORDER: COOPERATION AND CONFLICT AMONG THE MIMBRES (AD 550-1300)

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ABSTRACT

The Bioarchaeology of Social Order: Cooperation and Conflict among the Mimbres (AD 550-1300)

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Interpersonal conflict, social control, and culturally sanctioned violence are all potential modes of effecting change amongst most human groups. This research investigates the complex relationship between interpersonal violence, human skeletal biology, and social identity among prehistoric agricultural communities in the American Southwest. Using bioarchaeology as a research framework, the data presented in this study reveal patterns that can be used to better understand how violence is utilized or avoided in any time period. Bioarchaeology is well suited to investigate violence because it integrates the most direct evidence of conflict (traumatic skeletal injury) with detailed archaeological reconstructions of past human experiences.

A comprehensive assessment of Mimbres health, activity, and interpersonal violence was completed using data from a sample of 247 adult human burials from 17 Late Pithouse (AD 550-1000) and Pueblo (AD 1000-1300) sites in the Mimbres region. The findings presented demonstrate broader patterns for interpretation of community experiences that have not been as well described in previous case studies from individual
site samples. This larger sample of all available adult burials reveals relatively good health, low rates of interpersonal conflict (10.5%), and sufficient diets. Results do not indicate difficulty for any subgroups to maintain equal access to resources, especially during the peak occupation of the Pueblo period when population growth and exploitation of large game may have impacted survival.

Although some individuals from all time periods showed indicators of interpersonal violence, Mimbres communities do not appear to have had endemic warfare seen in other regions of the Southwest. Stress was perhaps mitigated then by social mechanisms or forms of social control that promoted cooperation and resolved conflict. The limited use of strategic interpersonal violence may have been one of the ways that social order was maintained. Mortuary data support archaeological indicators of a fairly simple political structure but atypical burials from multiple sites suggest differential status or social significance in the community. These individuals may have served special roles and both skeletal and mortuary findings better inform interpretation of Mimbres societal structure.
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DEDICATION

To Dale and Marbles.

Thank you for being there whenever I need you.

I lurve you.
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CHAPTER 1
INTRODUCTION

Cross-culturally, social order is maintained through a variety of complex behavioral strategies. Interpersonal conflict, social control, and culturally sanctioned violence are all potential modes of effecting change amongst most human groups. As such, understanding the role of violence in daily life is a complex process requiring multiple forms of data. These can range from extant biomedical and injury statistics to cross-cultural study of social interactions both in the past and the present. This research investigates the complex relationship between interpersonal violence, human skeletal biology, and social identity among prehistoric agricultural communities in the American Southwest. Using bioarchaeology as a research framework, the data presented in this study reveal patterns that can be used to better understand how violence is utilized or avoided in any time period. Bioarchaeology is well suited to investigate violence because it integrates the most direct evidence of conflict (traumatic skeletal injury) with detailed archaeological reconstructions of past human experiences.

Three major culture groups are most well-known for occupying the American Southwest in the pre-contact era: the Hohokam, the Anasazi (or Ancestral Pueblo), and the Mogollon. Each group maintained their own cultural identity in neighboring areas of the region: the Hohokam in the Tucson Basin of south-central Arizona, the Anasazi in northern Arizona and New Mexico into the Four Corners region, and the Mogollon spanning from the Mogollon Rim area south toward the Chihuahua Desert through
southern New Mexico. The Mimbres Mogollon people (AD 200-1350) in southwest New Mexico were located in the Mimbres and Gila River Valleys and their tributary regions. These are the focal population of this study. Greater detail regarding their culture history is described in the next chapter.

The Mimbres culture presents an excellent opportunity to explore the role of violence in everyday life because extensive archaeological excavation has revealed evidence of a “peaceful” society that was capable of adapting to periods of stress (Diehl 2006; Shafer 2006). Other prehistoric populations in the American Southwest, particularly Anasazi (Ancestral Puebloan) communities, faced similar stressful circumstances in equally harsh environments yet violence seems to have had a more important role in their experiences. To date, archaeological excavation of Mimbres sites has not yielded indicators of large scale warfare or even small scale raiding (LeBlanc 1999). The differences between the Mimbres and other contemporary and later Anasazi populations’ involvement in warfare therefore present questions as to what factors contributed to the use and escalation of violence as a behavioral strategy.

In this research, the bioarchaeological analysis of Mimbres burials contributes to the understanding of how interpersonal conflict occurred in the region by adding quantitative data on biological aspects of violence. The results document frequencies and patterns of traumatic skeletal injury and health to better interpret the role of violence in the daily socialization of Mimbres communities as well as during periods of stress or rapid culture change. The biological data from this study also assist archaeological interpretation of Mimbres social structure and other aspects of their cultural history.
Overall, the results reveal relatively healthy communities who did not engage in warfare but did use nonlethal violence to resolve interpersonal conflict. The Mimbres people were able to adapt to both environmental and cultural stressors through processes that mitigated violence more often than not. Much of this may have stemmed from the social organization of these communities.

**Investigating Social Order among Mimbres Communities**

This project used osteological and mortuary indicators to explore social organization and identity formation among prehistoric Mimbres communities. Mimbres archaeological data indicate egalitarian communities without observable social hierarchies (Diehl 2006; Gilman 1990, 2006; Shafer 2006). Extended family corporate groups have been suggested as important to Mimbres social organization and other communities in the American Southwest (Diehl 2006; Gilman 2006; Lightfoot and Feinman 1982; Schachner 2010; Shafer 2006). Excavation and analysis at the Harris site has investigated the presence of corporate group social structure (Roth, et al. 2012); however their visibility in the archaeological record is not currently accepted by all in the scholarly community.

It has been inferred that corporate groups promoted economic and social stability through redistribution of resources and wealth as well as mutual support in times of stress (Hayden and Cannon 1982; Lightfoot and Feinman 1982; Schachner 2010). Therefore, of particular interest for this study were the ways in which individuals and community groups interacted and mitigated conflict on a daily basis as well as during times of high
stress. A primary goal was to gain an understanding of the relationship between social structure and skeletal evidence of poor health and/or interpersonal conflict. The low rates of health issues across all demographic categories in Mimbres communities suggest that these groups may have worked under more cooperative social structures to provide equal access to resources. Relatively low levels of nonlethal violence and nearly absent observations of lethal trauma also indicate that the Mimbres people operated under social institutions that mitigated conflict and maintained social order.

The transition from a hunting and gathering subsistence to one of agriculture in the Mimbres region was likely one that brought about social and residential upheaval. Evidence of social shifts associated with this agricultural transition have led some scholars to suggest that extended kin groups assembled to share in political and economic efforts as well as ritual behaviors (Creel and Anyon 2003a; Hayden and Cannon 1982; Schachner 2010; Shafer 2006). For later agricultural Mimbres groups, this may have played an important role in maintaining the egalitarian lifestyles forged in their earlier hunter-gatherer and mixed forager-farming periods.

Social organization in prehistory can be recognized through division of economic efforts, specific gender roles, and community access to resources. Archaeological reconstructions of community social structure can assist in making inferences about interpersonal and community interactions. For example, interpretations of Mimbres gender roles suggest male participation in hunting and tool manufacture and female participation in food production, burden-carrying, and childcare (Munson 2000; Roth 2010). Bioarchaeological analysis has the potential to add more detail and support for
archaeological interpretations by contributing skeletal evidence of physical activities and health responses. Significant differences observed between males and females permit the bioarchaeologist to contribute to reconstructions of social interaction. This is what was found at the Anasazi site of La Plata (AD 1000-1300), where bioarchaeological analysis showed oppression of a subgroup of females believed to have been slaves within the community (Al-Gazali, et al. 2005; Martin 1998; Martin and Akins 2001). Data from the skeletons included cranial and postcranial injuries and heavily developed musculoskeletal attachment sites. These bioarchaeological data correlate with the deviant mortuary treatments observed by archaeologists to demonstrate differential social roles (that of captives) and lower status within the community. Among the Mimbres burials with accessible mortuary data, very few indicators of social distinction have been observed in past studies and this research corroborates those findings.

Social order is maintained when members of a community adhere to mutually agreed upon or hierarchically prescribed behaviors. Order, then, occurs when there is little to no resistance against others in the social group. One way of maintaining order may be through intimidation or threat. Violence or even the threat of violence can serve to coerce others to behave in a particular way. Harrod (2013), for example, presents the trauma, health, and mortuary data of individuals buried in Room 33 at Pueblo Bonito to suggest that these elites reinforced their power through the threat of violence. In this case, these elites enacted social control over others to maintain social order and compliant behavior. Social control can be implemented by restricting access to resources and is often recognized skeletally through poor nutrition and higher rates of disease among
subsections of a population (Klaus 2012). Harrod's study discusses male (and potentially occasional female) participation in nonlethal conflict to attain higher social status and his results from other communities in the San Juan Basin demonstrate differences in health and trauma rates to support varying levels of status and access to resources. This example illustrates one way in which violence is implemented as both a threat and an enacted strategy for promoting peaceful interactions and preventing large scale conflict. Archaeological and bioarchaeological indicators of Mimbres social organization allow assessment of the role of violence in either establishing or maintaining community cohesion when presented with social or environmental change. As the following chapters will reveal, violence did seem to be associated with Mimbres social structure and interpersonal behaviors.

**Research Objectives**

Reconstructing the ancient past through archaeology can be better accomplished if available biological data are included from bioarchaeological analysis. Research in the Mimbres region has been extensive and human burials have been encountered frequently, yet the amount of interpretation of these burials has been minimal. Even though retention and preservation of human remains has been inconsistent, meaningful analysis is still possible. The goal of this research was to expand the comprehension of ancient Mimbres communities through the addition of biological data from the human skeletal remains to existing data from archaeological excavation. Using a biocultural approach, analysis of
these skeletal data, mortuary contexts, and other relevant archaeological factors allowed a more complete reconstruction of daily life and adaptation.

This study sought to interpret human behavior as it pertains to the use or nonuse of violence and how/if that behavioral strategy varied across time and space. The first objective was to explore the relationship between interpersonal conflict, health, and wellness among ancient Mimbres communities. Skeletal indicators of lethal and nonlethal injuries, in addition to disease or poor health, have the potential to demonstrate the prevalence of social and/or environmental stressors. The rates of these injuries among demographic categories in each community can show differences in behaviors and risks for people representing those categories.

The second goal of this research was to assess correlations of skeletal indicators of health and activity for subgroups within the sample population. Results indicating violence, poor health, and/or hard labor were considered. The sample was examined according to age at death, sex, temporal assignment, community membership, and mortuary context (when available). Comparison of these subgroups has the potential to reveal patterns of high risk individuals and factors that could have led to higher morbidity and mortality. These can include biological characteristics, social qualities, or both.

Next, using skeletal indicators and contextual data such as mortuary treatment, an objective of this study was to interpret social organization, more specifically, vertical stratification to assess its role in the implementation of violence. When specific mortuary context is known, patterns in the burial sample can reveal social significance to the community. Moreover, associating these data with biological indicators of injury or poor
health can be used to elucidate demographic categories or social roles for individuals in the population. Because mortuary documentation varied in quality for each of the Mimbres collections studied, not all burials were included in assessment of such patterns.

An additional intention for these data was to consider them in conjunction with the archaeological context to explore the impact of social organization on interpersonal and community interaction. For example, observed differences within a vertical hierarchy (such as better health and wealthy burials) may correlate with rates of violent trauma and archaeological indicators of conflict. If leaders and subordinate subgroups can be identified in the community, rates of trauma may be able to indicate positive or negative relationships between the groups. Furthermore, if warfare is not suspected for the community, these data can demonstrate the use of violence as an indicator of social control to maintain community order and cohesion. Mortuary characteristics of some Mimbres burials demonstrated the potential for distinct social roles. Adding biological data also did not indicate leaders.

Lastly, the data provided by this research offer a comparative dataset to assess similarities and differences between other ancient southwestern culture groups in their utilization of violence. Given that other groups experienced similar physical environments and social structures, disparities in the prevalence of violence between communities should be able to be explained by the presence or absence of specific factors.

Data collected in this project provided insight into how relationships change over time and across space for Mimbres communities. The results from this study contribute
to the understanding of social dynamics for agricultural populations in marginal and uncertain environments worldwide. Comparison of results at different points during the chronology of the Mimbres highlights the ability of these people to withstand periods of heightened stress and illuminates what factors may have prompted or mitigated violence as a behavioral strategy. The Late Pithouse period (AD 550-1000) and the Pueblo periods (AD 1100-1150) were compared for rates of violent trauma and skeletal indicators of stress. The similarities and differences observed are addressed in the Discussion and Conclusions chapters.

**Hypotheses**

The strength of the methods employed in this project (see Chapter 4) lies in their standardization across many other studies (Glencross 2011; Goodman, et al. 1988; Olsen and Shipman 1994; Owsley 1994; Walker 1989). In addition, they are replicable, provide robust quantitative data, and can specifically address the research questions and hypotheses posed by this study. The ways in which individuals and communities adapted or failed to successfully adapt to stressors such as poor diet, communicable disease, and trauma can provide information about the nature and impact of particular kinds of social processes. This also guides theorization about broader impacts over time as Mimbres culture changed. The following hypotheses guided this research.

\[H1: \quad \text{There is no evidence of vertical social hierarchy within and between Mimbres communities.}\]

\[H0: \quad \text{There is evidence of vertical social hierarchy within and between Mimbres communities}\]
In order to assess Mimbres social organization in the region, bioarchaeological data were used to determine if some individuals within a community or entire communities altogether enjoyed longer lives, better health, and fewer instances of trauma. Evidence of this includes both biological and contextual data. Indicators of poor health and greater physical stress among a population or subgroup indicate differential access to resources or subordination by others using forms of social control. Cultural indicators of social stratification are identified by differential mortuary treatments, burial locations, and grave goods.

H1: Violent injury is negligible among Mimbres communities.
H0: There is evidence of violent injury among Mimbres communities.

This hypothesis was tested through analysis of skeletal injuries related to interpersonal conflict and violent attacks. Specifically, nonlethal healed trauma, including cranial depression fractures and post-cranial fractures, were documented. Lethal (peri-mortem) trauma was also documented.

H1: There is no evidence of increased use of violence and social control during periods of greater stress in the Mimbres region.
H0: There is evidence of increased use of violence and social control during periods of greater stress in the Mimbres region.

This was tested through quantitative analysis of skeletal injuries related to violent attack, in addition to indicators of limited access to resources. Both skeletal indicators and cultural indicators of social hierarchy were assessed for periods in which higher stress is suggested by archaeological data. Greater stress can be manifested during periods of deteriorating climate (e.g., drought or flooding), population aggregation, and significant cultural change. Of particular importance in the Mimbres cultural sequence
are the Late Pithouse period (AD 850-1000) and the late Classic period (AD 1100-1150) as these represent periods of social change (Anyon and LeBlanc 1980; Creel and Anyon 2003a; Shafer 1995, 2006) and climate change (Cannon 2000, 2003; Minnis 1985). During these periods of assumed greater population stress, higher frequencies of violent injuries and health problems would be expected. This research was designed to acknowledge any cultural factor that may have played a role in the decision to utilize or avoid violent action and to recognize that action through the skeleton and mortuary context.
CHAPTER 2
THEORETICAL PERSPECTIVES IN THE BIOARCHAEOLOGICAL STUDY OF VIOLENCE IN PREHISTORY

Exploration of human violence in prehistory requires an approach that can accommodate multiple forms of inquiry and contextualization of findings within a broad range of theoretical perspectives. This research demands that attention be given to both the biological body (i.e., the human skeleton) and the behaviors and experiences that affected it. The role of violence in its various manifestations within prehistoric Mimbres society is understood through reconstruction of archaeological and biological data and careful consideration of social theories that can explain behavioral strategies. Bioarchaeology, as a specialty within anthropology, serves as the perfect vector for understanding each of these areas in a holistic and nuanced way.

Within anthropology, biological anthropology incorporates a diverse array of research topics, methodologies, and contributions to the understanding of human behavior in the evolutionary past, more recent past, and present. Inquiry ranges from the origins of modern human and non-human primate anatomical function and adaptation to cultural and behavioral effects on human and non-human primates both in the past and present. Because of the holistic nature of anthropology, scholars are able to consider a vast number of data types to interpret human existence. Bioarchaeology in particular is well-suited to explore past human behavior, life styles, hardships, and experiences. It contributes to the understanding of the human past by incorporating biological data from
human skeletal remains within rich archaeological contexts (Agarwal and Glencross 2011; Armelagos 2003, 2011; Armelagos and VanGerven 2003; Buikstra 2006; Goodman, et al. 1988; Zuckerman and Armelagos 2011). Bioarchaeologists interpret the past by examining evidence from the body, mortuary and ritual, environment, and remains of social elements in society (Agarwal and Glencross 2011; Buikstra 2006; Goodman, et al. 1988). This project relies on each of these areas, in particular themes of gender, identity, and community social organization, to contextualize violence among Mimbres communities in the ancient Southwest.

**The Transition to Biocultural Approaches: Bioarchaeology**

Biological anthropologists in the early 20th century were fascinated by differences in physical appearance and variation among and between “races” of humans. Early biological anthropologists including Hrdlicka and Hooton were among the first scholars to expand beyond racial typologies. Through their work with museums (mostly on the American East Coast) and exploration missions such as the Hemenway Expedition, these two biological anthropologists began to pursue more nuanced research in which the variability among human populations was investigated (Armelagos and VanGerven 2003; Buikstra 2006; Zuckerman and Armelagos 2011). Unfortunately, Hrdlicka and Hooton focused on crania only and omitted postcranial skeletons most of the time. Furthermore, the context of these remains was not detailed, so much of that skeletal data has been lost. Hrdlicka and Hooton did, however, push biological anthropology to incorporate more question-driven data collection (Buikstra 2006; Martin 1998). This put the discipline in a
position to provide more data to interpret specific topics such as social relations and differential access to resources or treatment rather than just descriptive human variation (Martin 1998).

Moving into the 20th century, archaeology became more systematic and question-driven, impacting biological anthropology as it pertains to past human skeletal remains. The result was a paradigm shift that emphasized scientific process in research using hypothesis testing, strict methodology, and multidisciplinarity (Armelagos 2003; Armelagos and VanGerven 2003; Buikstra 2006). Bioarchaeological research transitioned to incorporate cultural contextualization and focus on population-level interpretations as the subfield emphasized a paradigm that was more holistic (Armelagos 2003; Buikstra 2006). A biocultural approach incorporates data from contextually specific variables in biology, environment, and culture of the population being studied (Armelagos 2003; Armelagos and VanGerven 2003; Goodman, et al. 1988; Zuckerman and Armelagos 2011). Consideration of factors in each of these topic areas allows exploration of a multitude of stressors and buffers experienced by the population. Use of a biocultural model permits evaluation of numerous processes of the human experience and prevents a basic skeletal analysis that would likely only result in basic demography and description of morbidity and mortality rates for the population.

Another major paradigm shift took place in bioarchaeology at the turn of the 21st century. Researchers became increasingly interested in the social aspects of past human communities and took on more complicated topics of research. The testing of methodology that was so popular in the prior decades was no longer a focus (Armelagos
Instead, bioarchaeologists have focused on more complex social issues such as ritual behavior (Duncan 2005), social inequalities (Klaus 2012; Perez 2012b), the use of violence (Klaus 2012; Martin, et al. 2012; Perez 2012a, b), identity (Buikstra & Scott 2009; Knudson & Stojanowski 2008, 2009), and materiality and agency of the human body (Sofaer 2006, 2011; Glencross 2011). The addition of social theory to bioarchaeological studies has greatly enhanced research featuring ancient populations. Perspectives from gender, political-economic, identity, and agency theories (to name a few) provide a framework for exploration of skeletal data at the most basic level. At a much greater level, however, these theoretical perspectives offer the opportunity to understand the cultural meaning of lived experiences and interactions for those being studied. They permit clarification and interpretation of how and why individuals and groups selected particular behavioral strategies in the past. This research approach, therefore, pushes the field to be more nuanced and truly a collaborative effort between biological anthropologists and archaeologists for a better interpretation of past human behavior (Martin, et al. 2013).

Bioarchaeology is thus an interdisciplinary field that permits inquiry into complex broad social themes regarding the human experience. As the nexus between biology and culture, the body (specifically the skeleton) serves as a symbol of broader social processes and meaningful lived experiences (Sofaer 2006). Issues such as social interactions (including violence) are therefore attainable research areas as the materiality of the skeleton is able to reveal responses to personal interactions, values, and

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1 For a summary, see Martin et al. 2013.
environment as well as the abilities of the lived individual. Physical suffering and/or enhanced status can be observed when culturally contextualized. This interdisciplinary field functions to expand upon the interpretation of individuals and communities in a way that goes beyond strict biological observations. The result is an appreciation of identity at both the individual and community levels.

Bioarchaeology serves as an excellent method to interpret Mimbres communities and biological effects of social change in the American Southwest. The biocultural approach that is applied in this project is flexible enough to accommodate data from a variety of disciplines. The social theory employed through bioarchaeology offers a broad suite of interpretations of the data generated. Collaborating with each other in this project, these research methods guide meaningful contemplation of Mimbres behaviors and foster a better appreciation of the human experience of past populations regardless of temporal assignment or geographic placement.

**Anthropological Approaches to Violence Research**

As a behavioral strategy, violence serves to provide its perpetrators access to resources or power over the victims, but the meaning of this behavior is always culture-specific and varies widely. It is a topic addressed by many scholars in a variety of settings but it requires specific contextualization for each population. Furthermore, the kinds of violence being discussed in these studies vary and their impacts on individuals and populations also differ. The following discussion outlines aspects of violence research and theoretical exploration relevant to this study.
Violence can be manifested in many ways. Its most obvious form, direct violence, is observed as focused, physical harm to another individual or group. Direct violence easily identifies a perpetrator, who deems the act legitimate, and a victim, who deems it illegitimate (Riches 1986). Less obvious forms of violence are generally indirect and include legitimized suppressive acts against an individual or group that result in decreased quality of life. First defined by Johan Galtung (1969), this form is called structural violence and functions within the social and political design of the community to oppress certain factions of the population and reduce quality of life (Bernbeck 2008; Klaus 2012; Perez 2012b). It may be a combination of social factors that predispose factions of a population to higher morbidity and mortality rates. This might happen, for example, when social or political organization is hierarchical and subordinate groups have reduced access to resources. Structural violence is often slow-acting and anonymous with regard to the perpetrator (Galtung 1969). Lastly, cultural (or ritual) violence serves to give approval of violent acts (whether direct or indirect) within particular contexts. This acceptance of violence replicates and perpetuates it within the cultural system.

Violence may be enacted by a single person or large mass of people. These actions range from interpersonal violence to large-scale warfare. Warfare is frequently equated with and used interchangeably with violence in archaeological discussions yet they can be manifested in very different ways. The archaeological record demonstrates warfare most frequently via catastrophic destruction or abandonment of whole communities, defensive architecture, buffer zones between communities, high rates of
burials with lethal injuries, atypical or lacking mortuary treatments for the dead, and weaponry (Ferguson 1997; LeBlanc 1999). In contrast to this, interpersonal conflict is not as readily recognized as it requires skeletal injuries (both lethal and nonlethal) in patterned locations not attributable to accidents (Guyomarc'h, et al. 2010; Martin and Harrod 2014; Novak 2006; Walker 1989, 1997).

Interpreting the meaning of violence in the past necessitates an understanding of social roles for individuals or groups involved (i.e., victim, perpetrator, or witness) as well as the larger social structure (Ferguson 2006; Guilaine and Zammit 2005; Otterbein 2004; Riches 1986). The objective of violent acts is to challenge and transform the social environment (Riches 1986). Nearly all scholars (see, for example Riches 1986; Schroder and Schmidt 2001; Whitehead 2004) emphasize that violence is culturally constructed; therefore it is imperative that those involved in conflict be identified so that the performance and meaning of violence can be interpreted. Each act of violence represents an expression of cultural symbols in which social identities and relationships are highlighted and challenged (Whitehead 2004). Resistance to authority and leadership roles, for example, might be observed in skeletal remains as evidence of deprivation (of resources) or defacement (Brandt 1994; Paynter 1989). The use of archaeological and bioarchaeological indicators of social roles, hierarchies, and status is therefore an important component to understanding why violence is used and what its intent may be.

Violence and social order need not be mutually exclusive concepts. Sluka (1992) suggests that there is a dual nature of conflict in which it “has both functional and dysfunctional aspects”. While violence may cause physical suffering, it may simply be a
factor in everyday social relations (Nagengast 1994). Violence can also be used to unite, create stability, and be progressive for a community (Perez 2012b; Wiessner 2009). Solidarity may be promoted by violence through collective efforts in large scale events or in the maintenance of the status quo in the social system where select individuals are engaged in physical or psychological conflict. The use of violence, or perhaps merely the threat of violence, may therefore be both negative (to the victims) and positive (to the witnesses) as it maintains social order by discouraging those that have challenged the system.

Implications of Bioarchaeological Explorations of Violence

Bioarchaeology functions to interpret past human behavior and lived experience through a wide variety of methods and theoretical approaches. With regard to explorations of violence, it offers a valuable approach because it contextualizes biological data in nuanced ways that permit insight into interpersonal and group conflict and the meaning behind such activities. The social dimensions of violence are ultimately what bioarchaeologists seek to identify as they pursue broader understanding of past populations (Martin and Harrod 2014).

Because bioarchaeologists study only the skeletal remains of the body, their analysis is somewhat limited by preservation and body representation. Judd (2002) and Walker (2001) caution that violence is underestimated in the archaeological record due to a sufficient lack of skeletal involvement of many injuries. They suggest that perhaps only as much as 40% of injuries affect the skeleton, leaving 60% of injuries in soft tissues.
only. Bioarchaeologists must therefore rely on both obvious and subtle indicators of stress on the skeleton and use these data in creative ways to interpret suffering and inequality. Through a biocultural approach, researchers have developed unique methods that assist in reconstructing violence in the past. The following case studies illustrate methods and theoretical perspectives that advance the subdiscipline of bioarchaeology in violence studies.

**The Violence of Slavery and Captivity**

Analysis of trauma on a skeleton at its most basic level indicates either violence or accidental injury. Specific details and patterning of the injuries are necessary, however, to fully interpret what these injuries represent. Furthermore, data provided by the mortuary context are crucial to reconstructing the identity of each individual. Work by Harrod and Martin (2014) among prehistoric populations in the American Southwest is building a bioarchaeological signature of slavery and captivity. Using injury recidivism as a primary indicator, these researchers bring together the archaeological context with skeletal pathologies and trauma over the life course to identify slaves and captives. Some males, but mostly females, at sites including Kin Bineola, Aztec Ruin, and La Plata in northwest New Mexico were observed to have numerous healed cranial and postcranial injuries, poor nutrition, and heavy labor burdens as evidenced by increased skeletal robusticity (Harrod 2013; Harrod and Martin 2014, In Press; Martin 1997; Martin and Akins 2001; Martin, et al. 2008; Martin, et al. 2010). The use of captives as a labor force is common (see, for example, chapters in Bener, et al. 1996), therefore the skeletal correlates of heavy burdens and activities are predictable. For
societies in which prestige was greatly impacted by slave ownership, raided captives would be expected. “Chore wives”, for example, were responsible for completing tasks such as hide processing or other craft production that would bring wealth to their captors (Stoltenberg, et al. 1999). Demographic reconstructions revealing high proportions of young adult females, especially those with trauma, may also indicate raided captive wives (Wilkinson 1997). These captives ultimately experienced lower social standing in the community and were frequently at risk for maltreatment and higher morbidity.

Comparative data from other burials within the focal communities are also vital, however, in making assessments of captivity and slavery. Those potentially identified as slaves or captives may demonstrate stark contrasts in health and trauma data in addition to mortuary contextual data that deviate from normal archaeological patterns. Collectively, the biological and cultural indicators lead the bioarchaeologist to interpret subordination and exploitation of an individual or a faction of the community. Broader archaeological findings can also be an indicator of the presence of captivity. Cameron (2008) and Junker (2007) note that evidence of warfare and raiding as well as nonlocal items should suggest the possibility of captives represented in the bioarchaeological record. Because captives could serve to increase power and social standing of the captors, it is important that this form of violence be considered in the investigation of cultural change and social dynamics of any past community.

Identifying Structural Violence and Social Control

Disproportionate morbidity or mortality data within a given population should be recognized as potentially related to the social and political structure of the community.
Without recognition of these factors, important patterns in the lived experience may be missed. When exploring the role of violence in a community, it is vital that these data be included. Thus, a biocultural approach to violence is the most thorough method for investigating violence in the past, particularly when it stems from the socio-political structure. Bioarchaeological studies identifying structural violence are somewhat limited to date as the use of biocultural modeling and social theory is still relatively new. Published case studies and literature pertaining to such research approaches are increasing however. As is illustrated in the examples to follow, Martin and Harrod (2014) present a pathway (Figure 2.1) for identifying archaeological and bioarchaeological indicators of culturally sanctioned violence.

![Figure 2.1. Cycle of analysis of violence. From Martin and Harrod (2014).](image-url)
Haagen Klaus’ (2012) research in ancient Peru exemplifies the utility of a biocultural approach to teasing out more subtle forms of violence that are embedded within societal practice. Health and trauma data among pre-Hispanic skeletons are reported by Klaus as indicative of systemic stress increases throughout the region as populations experienced colonial contact. Social structures were dramatically altered as colonial elites dominated the local populations and made them subordinate workers in their developing empires. Population aggregation occurred in response to colonialism, further escalating disease vectors and increased morbidity. Furthermore, increased domination by the Spanish contributed to more stark social stratification and differential access to resources among each sub-population. Ultimately, this stratification in the population was able to be observed in biological stress on the skeleton related to differences in diet, physical activity, and exposure to direct violence.

Structural violence also has been demonstrated to play a role in social control of populations in the ancient American Southwest. Research by Harrod (2012a, 2013) among burial populations from sites in the northern San Juan Basin during the Chaco Phenomenon documented differential patterns of direct violence that resulted from variation in social structures. Elites were identified at Pueblo Bonito using both mortuary data and skeletal indicators of better diet and overall health. Nonlethal violent injuries were observed among both males and females at sites throughout the region, but proximity to Chaco Canyon appeared to impact social structures and the frequency of violence. Harrod (2012a, 2013) argues that violence was a mechanism of social control in coercing the large amount of construction of the great houses as well as in maintaining
the higher status of the elite. The skeletal data in this study, therefore, suggest that structural violence occurred as differential access was embedded within the socio-political regime of Chacoan peoples.

**Domestic Violence**

Interpretation of different forms of violence relies heavily on patterns of injuries as well as the cultural context of the individuals affected by those injuries. The determination of domestic violence as a possible source of nonlethal injuries among prehistoric populations can vary but a thorough contextualization of the biological and archaeological data will permit differences in other forms of violence to be distinguished. In her analysis of prehistoric populations from coastal southern California, Lambert (1997) interpreted a more equal distribution of CDFs on the parietal bones (and not on the frontal as in males) as evidence of domestic violent conflict most likely perpetrated by husbands. Patterning of healed cranial depression fractures differed between males and females and across the lifespan. Examination of when injuries occurred suggested that female injuries occurred throughout the life course while male injuries tended to occur earlier in life. This patterning further indicates that males and females were incurring nonlethal injuries under different circumstances. Phillip Walker (1997) summarizes patterns of injuries associated with wife beating among modern Western populations. Attacks were most common to the face, particularly resulting in broken noses and eye orbit areas. Injuries incurred in modern and historic boxing matches show similar patterning. Walker (1997) demonstrates that patterns of nonlethal injuries are
best understood with reference to cultural contextual data and broad population-level analysis.

Domestic violence most frequently invokes images of female victims and male perpetrators but children are also likely victims and females can also be perpetrators. Children are not included in the sample of this study, therefore a discussion of child abuse is omitted; however injury patterns in both modern forensic and archaeological literature are prevalent and well documented (see, for example Gaither 2012). Violence between females in non-Western settings can take place for a variety of reasons but injuries are commonly inflicted from expedient weapons (e.g., sticks, rocks, or other nearby objects) as has been demonstrated in recent ethnobioarchaeological research by Harrod (2012b) and colleagues (Harrod, et al. 2012) among modern Turkana populations. Bioarchaeological examples of female-female violence are difficult to identify but two scenarios under which this form of violence could have taken place include co-wife competition for status (Webb 1995) and subordination of raided captives/slaves (Martin 1997; Martin and Akins 2001; Martin, et al. 2008; Martin, et al. 2010; Wilkinson 1997).

The identification of domestic violence, therefore, is complex and requires that the archaeological context of the sample population and trauma patterns be considered in tandem.

Ritual Violence

Ritual violence includes acts of harm observed in other violent contexts but it differs in that these acts express a symbolic value within the community that perpetrates it. Evidence of violence related to ritual practice can be observed in numerous ways.
Bones taken as trophies, for example, have been documented in many cultural contexts (e.g., Chacon and Dye 2007; Schaafsma 2007a; Schaafsma 2007b; Storey 2014) but their use in ritual distinguishes them from other forms of violence. The injuries observed on the skeleton may initially suggest direct violence but further contextualization (using mortuary or other forms of data) can negate certain interpretations. Cut marks on a skull, for instance, are typically associated with scalping among prehistoric American Indian populations; however, this may not be a lethal injury. Rather, the act of scalping the victim is associated with ritual ideologies that emphasized rain and agricultural success (Schaafsma 2007a). The prevalence of nonlethal cranial injuries among past populations has also been suggested as having ritual significance (Walker 1989, 1997). High numbers of healed cranial depression fractures among the prehistoric Chumash of California did not indicate the intent to kill, merely to maim, thus Walker (1989, 1997) hypothesized that fighting may have occurred to settle disputes through ritualized duels. Lethal conflict would have had consequences for the ability of a smaller community to thrive (Walker 1997).

**Violence as a Performance**

Lastly, numerous scholars have discussed the symbolic and performative nature of violence (e.g., Perez 2012b; Riches 1986; Schroder and Schmidt 2001; Whitehead 2004). By this, they mean to highlight the use of violence to communicate a message to any witnesses who may view the act or the results of violent action. Violence is thus a performance in which aggressors not only demonstrate dominance over the victims but also command the attention of witnesses. The witnesses, in turn, are likely to
acknowledge the power held by the aggressors and to communicate this to others. The act of violence is therefore a performance of dominance and power.

Massacres are easily categorized as performative violence when the homicidal death of many individuals occurs in a single event. One such example of violence as performance can be illustrated by the data and context of the massacre at Sacred Ridge, a prehistoric site in southwestern Colorado. The skeletal remains of 33 individuals were found mutilated and dismembered following an attack at the site (Stodder, et al. 2010). Analysis of the remains revealed extensive perimortem trauma which included evidence of hobbling of the feet of some individuals (Osterholtz 2012, 2013). This practice is argued by Osterholtz (2012, 2013) as a form of social control in which the aggressors tortured the victims through trauma that would cause immense pain and immobilization but not death. In this performance of dominance, the aggressors are suggested as communicating a message to both the victims and witnesses who might come upon the extremely processed remains at a later time. This performance of violence therefore symbolized an effort of the aggressors to either challenge current perceptions of their social standing in the area or a way of maintaining it.

Another example of performative violence is demonstrated by the mortuary contexts and extreme processing of the human remains at Castle Rock Pueblo and Sand Canyon Pueblo (Kuckelman, et al. 2002). Similar to the remains of those massacred at Sacred Ridge, many of the people of both of these communities died in a single event involving extreme violence. The human remains from these sites were disarticulated, fragmented, and often lacking formal mortuary features. Furthermore, substantial
evidence of violent attack was observed in the perimortem injuries including blunt trauma, crushing injuries, evidence of dismemberment, scalping, and burning. Collectively, these injuries (particularly the dismemberment and burning) indicate that anthropophagy (or cannibalism) may have taken place (Kuckelman, et al. 2002). This evidence could also represent events of witch executions (Lekson 1999). Regardless of the exact nature of the mass execution and desecration of people at Castle Rock Pueblo and Sand Canyon Pueblo, both are examples of violence as a performance. The means by which people were killed and the handling of their bodies afterward demonstrate intent on the part of the perpetrators to communicate a message of power and dominance to all witnesses.

**Summary**

This chapter presents theoretical perspectives for analyzing human skeletal remains for evidence of violence and the associated meaning of conflict in the past. Biocultural approaches to analysis of human burials foster broad contextualization and interpretation of human interactions. Furthermore, theoretical bioarchaeology allows nuanced inferences about the materiality and agency of human remains that offer much more utility than only biological data. While those biological data are useful, thinking of the body as the nexus between biology and culture (Sofaer 2006) expands the impact those data can have for exploration of social processes and lived experiences.

Similarly, violence research is presented with a focus on more than ideas of innate aggression. Using a theoretical approach, many forms of violence may be recognized.
These include direct, indirect, and cultural manifestations of physical harm or suffering. Identification of the more subtle and indirect forms of violence is more complex but is necessary to thoroughly understand how violence may play a role in a given population. Collectively, these observations further enhance an understanding of human interaction and adaptation to stress and the nature of violence as a performance that communicates greater cultural meaning.

Bioarchaeology is demonstrated as a method that can be flexible and accommodating of multiple disciplines in the exploration of violence in ancient contexts. Through contextualized analysis of human remains, several variations of violence (ranging from domestic violence to violence as a mechanism of social control) can be identified. Social theory then allows contemplation of the broader impacts of violence on cultural processes. The research and data presented in the following chapters exhibit a biocultural approach to a bioarchaeological examination of violence among the prehistoric Mimbres people of southwest New Mexico. Guided by the theoretical perspectives outlined here, this research exemplifies a well-rounded, multidisciplinary study of violence.
CHAPTER 3
THE EVOLUTION AND DECLINE OF THE MIMBRES CULTURE

Archaeological work in the Mimbres region has revealed a great deal of data pertaining to the prehistoric inhabitants and their way of life for approximately a millennium of occupation in southwest New Mexico. For the past century, archaeologists have excavated both small and large sites with varying degrees of occupation and use. The Mimbres and Gila River Valleys and areas around nearby tributaries comprise the majority of the landscape explored by researchers. From these investigations, we are able to interpret significant information regarding subsistence strategies, political economies, ritual ideologies, and other social processes. The following presents a brief culture history of the Mimbres Mogollon people and discussions on topics relevant to this research which focuses on the role of conflict and social control in both daily and long-term interactions.

Mimbres Cultural Sequence

The Mimbres culture is one sub-group of the larger Mogollon cultural horizon which also includes the San Simon, Black River, Forestdale, Cibola, and Jornada branches (Wheat 1955). Defined by Emil Haury after excavations in the Forestdale and Mimbres River Valleys, the Mogollon developed from archaic hunter-gatherer groups and occupied a region spanning from the Mogollon Rim at the northern periphery to the northern Chihuahua Desert on the southern periphery and from southeastern Arizona on
the western periphery to south-central New Mexico on the eastern periphery. The occupation of the broader Mogollon area is variable for each cultural branch with most local chronologies beginning with the onset of sedentism and a transition toward agricultural subsistence. The duration of each of these branch cultural sequences is also variable with some extending to the 14th century AD and others ending nearly two centuries earlier.

For the Mimbres Mogollon, the earliest phase in the chronology is the Early Pithouse period beginning at AD 200 and extending to approximately AD 550. It is characterized by seasonally mobile people who utilized both hunting and gathering and limited agriculture (Diehl 1997, 2001; Diehl and LeBlanc 2001). Early Pithouse period sites are typically located on high knolls above the river terraces and residential architecture takes the form of rounded semi-subterranean pithouses (Diehl and LeBlanc 2001). Sites are typically small with only a few structures likely for one or two family units. Ritual structures are not common. Ceramic technology (Alma Plain ware) first appears as small functional jars and bowls during this period, suggesting shifting subsistence strategies.

Next in the chronological sequence for the Mimbres people is the Late Pithouse period. This three-phase period lasts from AD 550 to AD 1000 and represents a time of great changes for the Mimbres Valley and surrounding areas. During this time, agricultural production intensified and became more of a permanent subsistence strategy. Evidence of this is demonstrated in the movement of community sites to lower elevations on river terraces which would have been closer to agricultural plots as well as greater
investment in storage features such as pits and ceramics (Anyon, et al. 1981; Diehl 1996, 1997). The likely utilization of irrigation technology also suggests a less mobile lifestyle. Finally, sedentism is indicated by more formal architectural construction and remodeling of structures over time.

Ritual architecture became more established in communities throughout the Late Pithouse period, particularly during the Three Circle Phase (AD 750-1000). Growing population size and changing social structure are suggested as important for necessitating integration of communities via communal architecture (Anyon and LeBlanc 1980; Creel 2006a; Hegmon 1989; Minnis 1985; Roth 2007). Great Kivas are well-established at Mimbres sites by the Three Circle Phase and ritual appears to be a major factor in community ideology and behavior into the Mimbres Classic period beginning around AD 1000 (Creel and Anyon 2003a, b, 2010; Shafer 1995).

Ceramic production evolved to reflect some of the cultural shifts taking place during the Late Pithouse period and into the Classic period. The first decorated wares appeared during the San Francisco phase (AD 650-750). These ceramics featured a red-on-brown style and then transitioned to red-on-white and black-on-white designs in the Three Circle phase. The black-on-white ceramic style began with geometric patterns (Styles I and II) and later (post-AD 1000) incorporated anthropomorphic imagery (Anyon, et al. 1981; LeBlanc 1983, 2006). Pottery served more than just utilitarian function however. The presence of some of these elaborately designed bowls (as well as other designed and plain wares) in mortuary and ritual contexts reveals additional ideological importance to Mimbres communities.
The peak time period in the Mimbres cultural sequence is the Classic period (AD 1000-1150). The primary identifying trait for this period is the transition from pithouse to pueblo architecture for domestic contexts. Often these pueblos were built over pithouses from earlier occupational periods; however, not all Classic period sites have pithouse occupations. Ritual architecture changed from subterranean Great Kivas to large plazas outside pueblo room blocks.

During the Classic period, the Mimbres people were fully entrenched in agricultural subsistence and the population size grew extensively. This influx of people led to the accretional growth of large pueblos at some sites along the Mimbres and Gila River Valleys. Pueblo room blocks were large and many had over a hundred rooms at the biggest communities. Within the Mimbres River Valley, the largest communities were positioned approximately 5km apart. The presence of so many people in these valleys pushed some people to establish smaller sites farther away along tributaries of these rivers as resources were maximized (Minnis 1985; Stokes and Roth 1999). Some of these less centralized, smaller sites thus demonstrate evidence of more mixed subsistence economies as the environments were not as conducive to intensive agriculture (Roth 2007; Stokes and Roth 1999).

The most widely recognized material culture from this time period includes Style III ceramics featuring anthropomorphic designs. Extensive research (e.g., Hegmon, et al. 2000; LeBlanc 1983, 2006; Mills 2000; Powell-Marti and James 2006; Shafer and Brewington 1995) has focused on the manufacture, design, function, and exchange of these ceramics and their importance within the Mimbres culture. Often, in addition to
common domestic and extramural contexts, Classic period Mimbres ceramics are found in human burials with intentional perforations or “kill holes”, thus suggesting that ritual significance was well established for these items.

The Classic period concluded for the Mimbres when the population size and agricultural subsistence economy exceeded the carrying capacity for the environment. This was spurred by a sequence of drought years during the early to mid-12th century which caused maize yields to be low (Minnis 1985). Furthermore, the overexploitation of area wood resources for pottery production negatively impacted local faunal populations, meaning the Mimbres were unable to revert to a hunting and gathering subsistence strategy that might have allowed them to remain in the region (Minnis 1985). The high dependence of the Mimbres people on agriculture prevented them from successfully adapting to a less productive environment at the population level. By the Terminal Classic period (AD 1130-1150), the Mimbres were already in a decline and their adaptive response was to disperse, although some sites maintained small occupations into the late 12th century (Creel 1997, 1999; Hegmon, et al. 1999).

The Post-Classic/Black Mountain phase encompasses the final period of the Mimbres cultural sequence and dates to approximately AD 1150-1300. In terms of terminology for this period, Post-Classic refers more to the eastern periphery of the Mimbres culture area (Hegmon, et al. 1998) and Black Mountain refers to the core Mimbres Valley area as well as the region south of it (Blake, et al. 1986). This time period was much more variable for Mimbres communities as some areas were nearly abandoned while others maintained habitation for quite some time. The scale of
occupation was much less than that of the Classic period however. Rather than stay in
large communities that were incapable of supporting such populations, smaller groups
(likely comprised of family units) dispersed and began to occupy smaller sites (Hegmon,
et al. 1999; Nelson 1999). Many of these sites were in the eastern Mimbres culture area
near the Rio Grande. The Post-Classic Mimbres remodeled and expanded Classic period
field houses in this area, forming pueblo hamlets (Nelson and Hegmon 2001). Black
Mountain phase occupations were even more diverse in the area south of the Mimbres
Valley. Common traits associated with these sites include adobe pueblos, both
inhumation and cremation mortuary practices, and non-local polychrome ceramics (Creel

Occupational continuity between the Terminal Classic and the Black Mountain
periods is debated among scholars. Two competing models discuss the method of
Mimbres dispersal and depopulation of the region. One model by Shafer (1999) proposes
that Mimbres people left the region for a period of time and then another population
migrated back. The different culture traits observed by Black Mountain inhabitants can
thus be explained by a different cultural identity. Creel (1999), on the other hand,
believes that the core Mimbres region was depopulated but not totally abandoned.
Therefore his model indicates a continuity of Mimbres culture that was reorganized,
resulting in an altered Mimbres identity.

The Saladoan Cliff phase concludes Mimbres chronology beginning around AD
1300 and lasting until approximately AD 1425/50 (Blake, et al. 1986; Hegmon, et al.
1999; Nelson and LeBlanc 1986). This time period in the Mimbres Valley was one of
sparse occupation that was much more variable than that of earlier populations. Nelson and LeBlanc (1986) discuss the likelihood of population movement from the Gila River area near present day Cliff, NM, eastward toward the Mimbres River area. Settlements were quite small and short-lived, resulting in a much lower population in the region than previous occupations (Blake, et al. 1986; Nelson and LeBlanc 1986). It is important to note that this phase applies only to the far western portion of the Mimbres culture area while those more eastern sites near the Rio Grande are considered Post-Classic Mimbres (Hegmon, et al. 1999; Hegmon, et al. 1998).

**Important Shifts in Mimbres Culture**

Major Mimbres cultural shifts can be identified throughout the chronological sequence. One key shift took place during the late Three Circle phase and the other occurred at the end of the Classic period. The first shift occurred as the Mimbres evolved a unique identity. Following a period of extensive interaction and subsequent influence, particularly with the Hohokam to their west, the Mimbres began to sever links with other culture groups (Creel and Anyon 2003a; Hegmon and Nelson 2007). While this was happening, the Chaco Phenomenon was also emerging to their north. Very little Chacoan influence has been observed in the Mimbres region (although see Lekson 1999)) and most exchange ceased to extend beyond the culture area although INAA data point to continued interaction in the Jornada region (Creel? Miller?). Additionally, ritual retirement of communal structures ends around AD 900, suggesting that ideologies were changing (Creel and Anyon 2003a; Gilman, et al. 2014). Thus, an inward focus by the
Mimbres people indicates a deliberate attempt to distance themselves from others and to establish their own identity. Diehl (2007) proposes that a distinct “Mimbres Phenomenon” was formed in the 9th and 10th centuries AD and the Mimbres became differentiated from other Mogollon peoples.

The shift toward a more insulated identity allowed the Mimbres to enhance whatever cultural behaviors they deemed important, free from influence by outside groups. During this period, the region transitioned from pithouse to pueblo architecture. Accompanying this was a change in mortuary practices. Burials had previously been placed in extramural contexts but moved to intramural locations around the time of the culture shift; though some occurred late. Shafer (1995) suggests that the changes in both domestic architecture and mortuary practices reflect an ideological transformation in which Mesoamerican concepts of the underworld were borrowed. Gilman and colleagues (2014) also propose Mesoamerican influences in ritual behavior, using parrots and macaws as well as iconography associated with the Hero Twins saga and the Popol Vuh as evidence.

Another important change occurred at the end of the Mimbres Classic period during the early 12th century AD. The population reached its peak size at this time but growth was halted by a quickly changing environment. Mimbres people were forced to adapt to such conditions in order to survive. The result was a breakdown of existing social organization, material culture production, ritual behavior, and subsistence regimes. Substantial research by Nelson and Hegmon (2001) and colleagues (Hegmon 2002; Hegmon, et al. 1999; Hegmon, et al. 1998; Nelson, et al. 2006) addresses movement out
of the Mimbres and Gila River Valleys. Behavioral changes are also indicated by the sudden appearance of non-local ceramics, particularly El Paso polychrome from the south and Tularosa black-on-white from the north, in the Mimbres core area during the Terminal Classic. Such ceramics suggest new forms of interaction and exchange with neighboring groups (Hegmon, et al. 1999). The onset of these new encounters indicates that Mimbres culture was changing once again and the identity of Mimbres people was being reshaped.

**Major Communities Featured in Study**

Human remains from seventeen Mimbres sites are included in this study. Most sites date to the Classic Mimbres period (AD 1000-1150) but some had earlier occupations as far back as the Early Pithouse period (AD 200-550). The majority of the remains, however, are San Francisco phase (AD 650-750) or later. The research strategy and excavation plan for each site varied, thus the number of burials excavated and collected for study also varied (see further discussion in Chapter 4). Also, some sites were excavated on more than one occasion and by different archaeologists. This has resulted in more excavated burials for some sites and fewer for others. Sites with the largest burials included in this study are introduced here and the circumstances of their excavation and subsequent burial samples will be discussed in Chapter 4.

**Harris**

The Harris site is well known in the heart of the Mimbres Valley because it was first excavated by Emil Haury in 1934 as he worked to define the Mogollon culture.
Located on the first terrace above the Mimbres River near the modern day town of Mimbres, the village was primed for the shift to intensified agriculture. Harris was solely a Late Pithouse period community and no evidence of a Puebloan occupation exists on the site.

Excavation in both the north and south portions of the site has indicated a social structure comprised of extended family corporate groups (Roth 2012; Roth, et al. 2012). Roth (2012; 2012) bases this interpretation on similar features and household groupings observed throughout the site. Examples of shared features include pots plastered into floors and later pithouses superimposed over earlier ones. The suggestion that the Harris community featured extended family corporate structures supports similar discussions at Galaz (Anyon and LeBlanc 1984), NAN Ranch (Shafer 2003, 2006), and Old Town (Creel 2006b; Creel and Anyon 2003a).

Galaz

Galaz is likely the most well-known Mimbres site due to its extensive excavation throughout the 20th century as well as its central location in the heart of the middle Mimbres Valley. Furthermore, data and artifacts from Galaz have demonstrated that it was one of the largest communities in the region. Occupation began in the Georgetown phase (AD 550-650) of the Late Pithouse period and extended to the Terminal Classic (AD 1130-1180) when it depopulated quickly (Anyon and LeBlanc 1984). A Black Mountain phase (approximately AD 1350) occupation is noted at the site but its continuity with prior Galaz inhabitants is not known (Anyon and LeBlanc 1984).
Ceramics have been plentiful from the numerous excavations at the Galaz site. The data from these items has allowed interpretation of numerous features of Mimbres life including subsistence strategy, environmental interaction, regional interaction, and ritual behavior (Anyon and LeBlanc 1984; LeBlanc 2006).

The Galaz community is also recognized for its importance in Mimbres ritual. Excavation of several communal structures has revealed significant data regarding ritual behavior (Anyon and LeBlanc 1980, 1984). Creel and Anyon (2003a, b, 2010) have extensively investigated the role of communal structures in Mimbres ritual and community integration. They propose that ritual ceremonies carried out in communal structures like those at Galaz are linked to agricultural intensification, residential stability, and changing interactions with others in the region. Associated with these communal structures, numerous macaw and parrot burials have been uncovered at Galaz (Anyon and LeBlanc 1984; Creel and McKusick 1994). These birds had to be transported a very long distance from Mesoamerica, thus bolstering their likely ritual significance and the importance to community events (Creel and McKusick 1994; Gilman, et al. 2014).

**Wind Mountain**

The Wind Mountain site differs from most included in this study because it is located west of the continental divide along a tributary of the Gila River while nearly all of the other sites are in the Mimbres Valley. People occupied the site throughout the Mimbres chronology, beginning with a limited presence during the Early Pithouse period (AD 250-550), peaking with a Late Pithouse period community, and culminating with a
small Classic and Terminal Classic population (Woosley and McIntyre 1996).

Architectural features at the site demonstrate typical Mimbres traits for each time period of cultural development but additionally, there is also possible transitional Mangas phase (AD 950-1050) architecture in some structures (Woosley and McIntyre 1996).

The inclusion of Wind Mountain burials in this study is important because it represents the only western sample in the dataset. It provides an opportunity to compare regional rates of health and stress indicators. Furthermore, these burials represent a time of great social and cultural changes occurring in the Mimbres region so the skeletal data are important for showing the biological effects of these changes.

NAN Ranch Ruin

NAN Ranch Ruin is a Late Pithouse and Classic period site (AD 600-1140) in the middle Mimbres River Valley (Shafer 2003). Extensive excavation between 1978 and 1989 has produced a great deal of data on both archaeological and bioarchaeological finds. Important data on social practices, ideology, and mortuary ritual has been assembled from the many pithouses, rooms, and burials excavated. Much of Shafer’s (1985, 1995, 2003, 2006; 1998; 1989) work has emphasized the cultural shifts during the pithouse to pueblo transition around AD 900 to AD 1050. Specifically, he suggests that extended lineage corporate groups formed the basis of the community social structure and uses the shift to intramural family cemeteries and different mortuary patterns to indicate a more formal ritual complex.

The burials resulting from excavations at NAN Ranch Ruin are vital to this study for numerous reasons. Most importantly is the size and preservation of the burial sample.
Burials from NAN make up the largest proportion of this dataset. Also important, however is the available contextual data that accompanies these individuals. Collectively, they permit a more comprehensive interpretation of Mimbres life in both the Late Pithouse and Classic periods.

Cameron Creek

The Cameron Creek site is located southwest of the heart of the Mimbres River Valley above its namesake creek. Although significantly excavated in the late 1920s by Wesley Bradfield, a thorough analysis of the archaeological discoveries is lacking. Thus, contextual information is sometimes incomplete. The community was occupied during both the Late Pithouse and Classic periods however specific dating of the occupation is not available. The most prominent information known about Cameron Creek is derived from the plentiful documentation of ceramics excavated. Unfortunately, mortuary data is almost nonexistent and the human remains have little associated context. Even so, the inclusion of such burials in this dataset is important because these individuals represent a population away from the Mimbres River.

Swarts

The Swarts Ruin in the middle Mimbres River Valley was one of the first sites to be systematically excavated in the region, albeit by amateur archaeologists. Dating to approximately AD 800-1130, data from Swarts are valuable in many respects ranging from architecture to mortuary customs. Most prominent, however, is the detailed documentation of ceramics recovered during excavation of the two large room blocks, over a dozen pithouses, and over 1,000 burials (Cosgrove and Cosgrove 1932). Swarts is
notable in the region for its size and likely involvement in the regional system. Data from these early 20th century excavations are frequently utilized in comparison to NAN Ranch and other large Late Pithouse and Classic period Mimbres sites (see for example Creel 1989). Even though the Mogollon culture hadn’t yet been defined, the Cosgroves (the site’s excavators) ultimately deemed it a typical Mimbres community (Cosgrove and Cosgrove 1932).

Old Town

The Old Town site is located in the lower Mimbres River Valley and has served as an important source of data regarding life in this region of the Mimbres culture area. Its position on the dryer, hotter landscape forced slightly different environmental and cultural adaptations than other Mimbres communities farther north. Old Town was occupied from approximately the end of the Early Pithouse period around AD 500 until the Black Mountain phase around AD 1300 (Creel 2006b). The longevity of occupation, particularly the latter end, has provided essential data for understanding what happened to the Mimbres people following the Terminal Classic period (AD 1130-1180).

Creel (2006b) has identified the Old Town site as one of at least two pre-eminent ritual communities in the region. Like Galaz, large communal pit structures and other ritual architecture have been uncovered (Anyon and LeBlanc 1984; Creel 2006b; Creel and Anyon 2003a). The excavation of a scarlet macaw at Old Town further supports its position as an important ritual center (Creel and McKusick 1994).

Lastly, the Old Town site revealed new information about community social structure that had not been demonstrated at other excavated Mimbres sites. Creel (2006b)
observed pithouses organized around a common courtyard, suggesting that extended families formed corporate groups and acted together in the community. This was similar to suggestions made by other researchers based on other site excavations (Anyon and LeBlanc 1984; Creel and Anyon 2003a; Roth, et al. 2012; Shafer 2006) but was unique for the Mimbres region because it was the only documented grouping to resemble Hohokam courtyard groups.

**Mattocks**

The Mattocks site is located in the central Mimbres River Valley on the first terrace above the river. It was initially settled around AD 550 during the Late Pithouse period and occupation lasted until the Terminal Classic period around AD 1130 (Gilman 1990; LeBlanc 1983). Although much of the site had been previously excavated as well as looted, excavations by the Mimbres Foundation in the 1970s revealed important data regarding culture change during the Mimbres chronology. LeBlanc (1983) describes an abrupt shift from pithouses to pueblo architecture in the late 10th century AD. Architectural changes in pithouse shape and roomblock design are documented throughout the Late Pithouse period and into the Classic period. LeBlanc (1983) suggests that these may have been motivated by social organization and potentially even ritual systems. Overall, the site presents valuable data to support reconstructions of Mimbres cultural development that have been carried out using data from other sites.
Mimbres Social Structure

Social organization among Mimbres communities requires discussion of both domestic and ritual contexts. During the Late Pithouse period, the evolution of Mimbres culture can be described as flourishing. As communities became more established, the social structure of inhabitants had to adapt to become more formalized. Prior to this time, small families were likely the primary social units occupying sites. Population growth and the expansion of these groups required social processes to accommodate interaction of multiple groups in the same communities. Thus, a shift toward integration via communal structures is apparent.

At the same time, families with longevity (perhaps founding lineages) in communities likely achieved some form of status within the population. Roth (2012) and colleagues (2012) have proposed a corporate group social structure at the Late Pithouse period Harris Site. Within this social organization, corporate groups were necessary for management of land tenure in the agricultural subsistence economy. It has been inferred that corporate groups promoted economic and social stability through redistribution of resources and wealth as well as mutual support in times of stress (Hayden and Cannon 1982; Schachner 2010). Shafer (2003, 2006) suggests that competitive corporate groups formed when extended family cooperation was used to implement irrigation technology. Creel (2006a) and Anyon (2003a) also support a corporate social strategy in Mimbres society. Corporate groups have been identified by Roth (2012) via clusters of households sharing the same traits. Creel and McKusick (1994) suggest that these clustered households may have had social significance within communities.
A corporate group social organization would have benefited large communities, but what about social status for individuals? Generally, archaeological data have suggested that the Mimbres people utilized an egalitarian social structure and lacked stratified status hierarchies (Diehl 2006; Gilman 1990, 2006; Hegmon 2002; Munson 2000). A study of Classic period mortuary patterns did not reveal differential burial treatment of individuals, thus it supports this egalitarian model (Gilman 1990, 2006). Biological data from human skeletal remains have not yet demonstrated differential social rankings; however, no study prior to this one has directly addressed this issue. Diehl (2006) suggests that Mimbres communities likely had some form of hierarchy and social inequality although they are incredibly difficult to identify. Hegmon (2002) proposes that higher status for some individuals could have come from participation in ritual activities. Women may have gained social prestige from family relationships and corporate group membership (Munson 2000). It is possible that women also achieved status through their involvement with the procurement and rearing of Mesoamerican birds (Gilman, et al. 2014).

The use of mortuary treatment as an indicator of social significance is becoming more important to questions regarding status hierarchies in Mimbres society. More than the number of items buried with an individual, burial construction and position of the body are potentially indicative of social significance. Creel (2006a, b) has identified burials of possible religious leaders who would have held elevated positions in the Old Town community. The mortuary treatment of these individuals was unique; therefore special attention was afforded these people. Cremations have also been proposed as
mortuary treatments reserved for higher status individuals or those with some social significance; however, this is difficult to demonstrate (Creel 1989). As this dissertation will later discuss and previous research (Baustian and Roth 2013; Roth, et al. 2012) has proposed, some Mimbres individuals buried in upright seated positions may also represent community members with social importance or rank.

**Mimbres Conflict**

Recognition of the presence or absence of social status is important in this study because it demonstrates interaction between factions of the population both at the community and regional levels. Understanding how individuals and groups maintained relationships helps interpretation of periods when stressors have the ability to disrupt social organization and cultural behavior. The behavioral response of the people at these times can often be one of violence toward one another or other groups. In order to understand the role of violence as a form of social control over others, it is necessary to broadly contextualize many types of evidence of past interpersonal and group interactions. Without this kind of integrated approach, interpretation of violence is typically reduced to conflict over resources or environmental stress. While often a valid explanation, it is not the only explanation for violence between communities. Furthermore, conflict can also involve violence between individuals on an interpersonal level. The role of violence in these contexts can be very different from community warfare or raiding.
For the Mimbres culture area, violence and conflict have not been the focus of many discussions pertaining to behavior. Violence and evidence of social control have not been reported. The only exception to this is a hypothesis by LeBlanc (1999) that suggests that higher elevation sites during the Early Pithouse Period (AD 200-550) are defensive and served to protect those living there. Defensive architecture (e.g., fortification walls) has not been observed or described for Mimbres sites. LeBlanc (Diehl and LeBlanc 2001) argues that early Mimbres populations intentionally occupied hilltop sites for their defensive qualities, even though they may have been hazardous due to frequent lightning strikes (per communication with local modern farmers). Alternatively, Diehl (Diehl and LeBlanc 2001) perceives hilltop sites as necessary for resource monitoring. Beyond this, no data have been presented as indicating violence or the threat of violence.

In the Mimbres region, the lack of archaeological evidence of warfare and raiding is often used to argue that violence was not present. Reports and published literature pertaining to numerous sites in the region rarely mention violence or warfare in descriptions of architecture, artifacts, or other aspects of archaeological excavations. Hegmon and colleagues (2008) have noted a lack of evidence of warfare among Mimbres populations; however, their assessment did not include consideration of biological data from skeletal remains. Decapitation is occasionally discussed when referencing particular anthropomorphic designs on ceramic vessels (Nelson and Hegmon 2010) and when burials are discovered without crania (Creel and Anyon 2003a), but no skeletal evidence has been presented to verify this practice. Biological data in the form of cranial
fractures, defensive injuries, cut marks on bone, and injuries associated with specific weaponry are important because they confirm that violence has taken place. Furthermore, using contextual data, a role for violence can be proposed or other explanations (like ritual practice) may be indicated for acts such as decapitation if, in fact, they actually occurred at all.

**Conflict in the Greater American Southwest**

Steven LeBlanc (1999) has proposed that warfare and interpersonal violence were ubiquitous throughout the prehistoric American Southwest with higher levels early (AD 200-900) and late (AD 1200-1450) and lower levels during the middle period (AD 900-1200). Other scholars have also investigated the role of violence during these time periods and have shown that violence played a complex role in social control and daily life for communities in the Four Corners region (i.e., the Anasazi) during periods of stress (Hegmon, et al. 2008; Kohler, et al. 2014; Kuckelman, et al. 2000; LeBlanc 1999; Nelson 1999; Potter and Chuipek 2010). Archaeologists base their findings on evidence such as weapons, artistic renderings (petroglyphs and pottery design), site features such as defensive architecture, the catastrophic destruction and/or abandonment of communities, and finally burials (LeBlanc 1999; Rice and LeBlanc 2001; Wilcox and Haas 1994). Many of these indicators demonstrate that violence played a role in daily activities and that forethought was necessary in the design and construction of sites and in the manufacture of weapons.
Violence has been documented at many Anasazi sites during the PIII (AD 1100-1300) period and some sites during the earlier Basketmaker III (AD 500-700) and PI (AD 700-900) periods. Populations of the early period of occupation did not experience violence at high levels; however there are a few examples where it did occur. For instance, direct evidence of conflict was discovered at the site of Wetherill’s Cave 7 where 97 Basketmaker burials were found. LeBlanc (1999) describes traumatic death as evidenced by embedded and associated projectile points, many broken arms and heads, skull bludgeoning, possible scalping, and removal of ears and heads. War-related items were also found in two formal burials of males in the cave.

Another example of early period Anasazi violence is the massacre and perimortem mutilation of 35 individuals at a PI site near Durango, Colorado. Potter and Chuipka (2010) present data from excavations of Sacred Ridge where multiple pit structures were found to contain human skeletal remains with varying degrees of mutilation and perimortem modification. Nearly 15,000 skeletal fragments represented 35 individuals (ranging in age from infant to adult) who had been tortured and killed and whose bodies were subjected to extreme processing (Stodder, et al. 2010). Evidence of extreme processing included scalp marks, chop marks, cut marks, scrape marks, perimortem fracturing of long bones and vertebrae, and burning.

Moving into the late period (post AD 1150) of the Southwest chronology, evidence of warfare increases significantly in the Anasazi region. One way this is shown is through clustering of sites and vacant lands between clusters (Keeley 2001; LeBlanc 1999, 2000; LeBlanc and Register 2003; Schaafsma 2007a). This aggregation occurred
over several decades in the late 13th century AD and occurred in many areas (LeBlanc 1999; Wilcox and Haas 1994). Site aggregation has been described as a method for assistance and defense among communities (LeBlanc 1999). During times of attack, the clusters would serve to provide mutual protection through direct visualization of each other. Cliff dwellings are particularly suggestive of defense strategies as they would have been very inaccessible. Sites such as Cliff Palace, Balcony House, and Mug House exemplify this.

Bioarchaeological data in the late period Anasazi region demonstrate significant amounts of violence taking place between groups. Much of this evidence is visible in the archaeological record as informal burials, extreme processing of human remains, and burning. Sites with strong evidence of violence include (but are certainly not limited to) Castle Rock, Sand Canyon Pueblo, Mancos, Cowboy Wash, and Aztec Wash (Kuckelman, et al. 2000, 2002; Turner II and Turner 1999; White 1992). Human remains excavated from these sites exhibit both lethal and non-lethal injuries, some of which happened prior to the events that caused their deaths. For some individuals, then, violence was frequent throughout their lifetime.

Items associated with warfare are more abundant during this period at Anasazi sites. Weapons like the sinew-backed, recurved bow have been described by LeBlanc (1999) as having great significance in violent attacks against others. Specifically, the recurved bow is credited with changing violence from close-contact fighting to more distant attack methods. In addition to the bow and arrow, wicker shields, clubs, and stone tools could have been used in warfare (LeBlanc 1999). Finally, the depiction of warfare
and weapons in art is found more frequently as well (Crotty 2001; LeBlanc 1999, 2000; LeBlanc and Register 2003; Lightfoot and Kuckelman 2001; Schaafsma 2007a). Shields, shield bearers, weapons, and warriors are all depicted in rock art, pottery, and kiva decorations (Crotty 2001). This may be indicative of violence becoming increasingly more common in Anasazi daily life after the 10th century AD.

Conflict among these communities appears to be correlated with a complex suite of stressors, but primarily deteriorating climate, food stress, and demographic instability associated with regional social upheaval (Lekson 2002). Associating these stressors with raiding and warfare is common practice yet scholars fail to examine why other communities do not resort to violence in response to stress. What social mechanisms might function to prevent greater stress, injury, and/or death due to conflict? Harrod (2012a, 2013) has examined the use of social control as a factor in rates of violent injury among Chacoan communities. Through mechanisms of social control, the population conforms to community-mandated behaviors which then prevent upheaval. The bioarchaeological and archaeological result of social control is thus a lack of evidence of lethal skeletal injury, weaponry, or other indicators of violence. Instead, non-lethal injuries such as cranial depression fractures might be observed (Harrod 2012a, 2013; Harrod and Martin In Press).

This research examines skeletal, archaeological, and social data to show how each (respectively) interacts with the others to reveal evidence of adaptation to stress either through violence or other means. For example, a change in ritual behavior could be an indicator of mitigating conflict through the enhancement of social relations in the
community. Abrupt depopulation of the site could suggest that social cohesion was not present and competition over resources caused residents to disperse before resorting to violence to obtain those resources. Lastly, evidence of skeletal injuries or disproportionate rates of disease can suggest factions in the social organization of a population which are useful in interpretation of community interaction. What all of these examples demonstrates is that multiple forms of data collectively inform the researcher about many aspects of the community. The key element to this analysis is thus contextualization of all forms of data so that nothing is overlooked and a more nuanced interpretation can be made.

Bioarchaeological Research in the Mimbres Region

Bioarchaeological data for the Mimbres region is severely deficient, although not for lack of access to human skeletal remains. Nearly all Mimbres site excavations encounter human burials and historically most have been excavated (prior to the passage of the Native American Graves Protection and Repatriation Act). Even with significant opportunity to study human remains from these sites, little analysis has been completed and few publications have resulted. Most of what has been done exists only as an appendix in a site report that focuses on the grave goods and has little to no biological data to report. Master’s and dissertation projects have investigated human remains from single sites or up to a few sites, but no comprehensive, regional analysis has been completed. The majority of research has assessed skeletal and/or dental health, evidence of physical activity, or demography of a particular site (Bauer-Clapp 2005; Hinkes 1996;
Few of these studies have addressed larger social issues regarding Mimbres society as a whole, thus the existing biological data does not make substantial contributions to broader questions regarding the Mimbres culture.

Occasionally, individual burials have been highlighted in site reports and published literature and it is these studies that have contributed the most information about Mimbres bioarchaeological data. Because these burials often stand out as unique from common mortuary practices, they are well-documented and contextualized. For example, Shafer and colleagues (1989) published findings of a bioarchaeological analysis of an adult male at NAN Ranch. This burial was highlighted because the body was associated with a human coprolite. Results from this study were important for reconstructing the diet and environment for Mimbres communities as well as compassion and care of the sick.

Other studies highlight burials with unique or high numbers of grave goods (Anyon and LeBlanc 1984; Creel and Anyon 2003a; Shafer 1985). Creel and Anyon (2003a), for example, discuss the significance of burials in or around communal structures at Mimbres sites. They note the importance of the placement of the body in relation to the floors or walls of communal structures. They also describe a child with the most ceramic vessels and jewelry ever recorded in a Mimbres burial (Anyon and LeBlanc 1984). Their examples of specific burials at Galaz and Old Town are used to interpret importance in the community, but the only biological data presented are approximate age and sex of the individuals. Much more information gleaned from the skeletal remains of
these individuals could likely bolster their reconstruction of mortuary and ritual behavior as well as other aspects of Mimbres communities.

Lastly, a couple of studies have addressed issues pertaining to genetic relatedness of Mimbres and other prehistoric Southwest populations (LeBlanc, et al. 2008; Snow, et al. 2011; Taylor and Creel 2012). These inquiries demonstrate that the Mimbres shared some common ancestry with northern Mexican populations yet they were not isolated from other Southwest groups either. Some admixture with regional populations is apparent (Snow, et al. 2011) which supports theories of intermarriage practices.

What this bioarchaeology research demonstrates is that there is a great deal of data that is yet to be gathered and interpreted for Mimbres populations. These data will build upon the more basic information that currently exists and expand our understanding on a wealth of topics pertaining to this region. Biological indicators from human skeletal remains sampled from the entire Mimbres culture area are used in this study to provide a more comprehensive interpretation of the population as a whole and over time.

**Summary**

The Mimbres Mogollon people occupied a region near the continental divide in modern southwest New Mexico, specifically near the Mimbres and Gila Rivers. Spanning from approximately AD 200 to AD 1400, this culture group evolved from semi-mobile, mixed forager-agriculturalists to sedentary, dedicated maize agriculturalists. With the development of this mode of subsistence came population growth and increased cultural complexity. While social organization has not indicated vertical status hierarchy,
some less formal leadership roles may have existed in the areas of ritual and family politics as they pertain to land tenure.

Ceramic production remains the most documented cultural trait of the Mimbres people and the unique styles of pottery provide information regarding ritual, exchange, and gender roles. Agricultural intensification and resource utilization are also important topics for Mimbres researchers. Cultural data that have been less significant for scholars include mortuary practices and biological data from human burials. These data are only occasionally addressed.

Crucial to interpreting the cultural trajectory of Mimbres culture is recognition of the major changes that occurred throughout their occupation of the Southwest. Ideological shifts during the Late Pithouse period spurred new ritual behaviors and likely correlate with other functional behaviors as well. These include ceramic design and architecture. These cultural elements peaked during the Classic period around AD 1100. In the decades following this, the regional population declined as deteriorating climate, combined with an overexploitation of resources, forced drastic changes in occupation of the area. The remaining cultural sequence of the Mimbres was one of social reorganization and population movement throughout the region until it culminated around the end of the 14th century.

Unlike other areas of the American Southwest, warfare and violence have not been extensively studied for the Mimbres region. The primary reason for this is the lack of obvious indicators (e.g., weapons, catastrophic abandonment of sites, defensive site features) that warfare has occurred. This is problematic however because lack of
evidence to suggest violence is not equivalent to evidence of violence lacking in this prehistoric population. Using skeletal indicators of both direct and structural violence is a vital component to making inferences regarding past use of warfare and events associated with conflict. This includes both large scale and small scale interpersonal conflict. To date, these data have not been collected for Mimbres populations.

This dissertation research provides an opportunity for exploration of the use (or active avoidance) of violence and social control among the prehistoric Mimbres. When facing stress associated with the environment, population size, or other cultural factors, the Mimbres had options in terms of their response. Recognizing and understanding major cultural changes is important for realizing the trajectory of behavioral response to stressors both within and outside the community. How a population chooses to engage with other groups can be directly correlated with shifting ideologies and perceptions of identity. As the Mimbres became more inward-focused, they elected to cut off most links to outside groups. While this had significant impacts for their own daily activities, it also could have affected their ability to handle stress. Research by Rautman (1993) suggests that the maintenance of external social networks can be vital during periods of resource stress. Because the Mimbres chose to remain self-sufficient, they might have made themselves vulnerable to failure during the Classic period when the population climaxed and the climate deteriorated, leaving a shortage of resources. Furthermore, ethnographic work by Ember and Ember (1992) found that violence most frequently occurs when people fear future environmental destruction and when they mistrust others. As discussed earlier, other areas and time periods in the American Southwest have shown
extensive evidence of violence as a response to these kinds of conditions, so it is interesting to posit that the Mimbres may have had other cultural or social mechanisms to prevent such reactions to stress.

The contributions of biological data from human skeletal remains are applicable to a vast variety of queries regarding prehistoric populations like the Mimbres. This bioarchaeological study offers data that can inform scholars about topics ranging from community response to stress to social organization. Contextualization of these data within the great array of archaeological information permits greater understanding of how the Mimbres lived on a daily basis as well as how they changed over time.
CHAPTER 4
MATERIALS AND METHODS

The goal of this study is to establish a dataset of human skeletal indicators of health and trauma through a systematic and scientific analysis of Mimbres burials. Complemented by archaeological evidence, these data permit interpretation of the interactions and social dynamics within and between communities in the region and the role of violence in each setting. Two phases of analysis have been carefully designed to provide the most reliable and informative data (see Table 4.1). The first phase of analysis sought to provide a bioarchaeological reconstruction of the burial sample. This process involved assessment of both demographic and archaeological information for all human skeletons. The second phase of analysis had the objective of establishing a biocultural identity for each subset in the burial sample. Biological indicators were used to identify possible differences in the lived experiences of those in the sample. Collectively then, the bioarchaeological reconstruction and the biocultural identities of burials provide a profile for life in Mimbres communities.
**Table 4.1.** Research methodology organization.

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<td>Trauma</td>
<td>Antemortem (non-lethal) injuries</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Perimortem (lethal) injuries</td>
<td></td>
</tr>
</tbody>
</table>

**Materials**

A secondary objective for this project has been to present a more comprehensive collection of skeletal data for Mimbres burials so that all scholars working in the region and time period can be better prepared for archaeological reconstruction. All available Mimbres skeletal remains were therefore sought for inclusion in this study. Extensive excavation of Mimbres sites has resulted in thousands of encountered burials; however only a small fraction of those have been systematically excavated, recorded, and curated in archaeological collections. Of those collected, preservation is generally poor and quality of curation varies. Thus, data available from Mimbres burials are limited and analysis of every burial was not possible in this study.

This project presents the most complete assemblage of Mimbres burial data to date. Burials were included in the study if they were excavated at a Mimbres site in a
manner deemed scientifically appropriate (i.e., systematically documented and collected). All time periods from Mimbres cultural development were included; however some burials lacked solid chronological association. All efforts were made to associate burials with their respective temporal periods using multiple archaeological indicators. Human remains from six repositories and one active field excavation were analyzed. These represented individuals from 18 sites, resulting in a total of 247 individuals in the study (Table 4.2).

<table>
<thead>
<tr>
<th>Site</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bradsby</td>
<td>4</td>
</tr>
<tr>
<td>Cameron Creek</td>
<td>21</td>
</tr>
<tr>
<td>Disert</td>
<td>1</td>
</tr>
<tr>
<td>Galaz</td>
<td>39</td>
</tr>
<tr>
<td>Harris</td>
<td>24</td>
</tr>
<tr>
<td>Mattocks</td>
<td>17</td>
</tr>
<tr>
<td>Mitchell</td>
<td>3</td>
</tr>
<tr>
<td>Montoya</td>
<td>3</td>
</tr>
<tr>
<td>NAN Ranch Ruin</td>
<td>66</td>
</tr>
<tr>
<td>Old Town</td>
<td>6</td>
</tr>
<tr>
<td>Swarts</td>
<td>19</td>
</tr>
<tr>
<td>Treasure Hill</td>
<td>3</td>
</tr>
<tr>
<td>Walsh</td>
<td>3</td>
</tr>
<tr>
<td>Wheaton-Smith</td>
<td>1</td>
</tr>
<tr>
<td>Wind Mountain</td>
<td>33</td>
</tr>
<tr>
<td>Z.14.20A</td>
<td>1</td>
</tr>
<tr>
<td>Z.14.20B</td>
<td>1</td>
</tr>
<tr>
<td>LA 18839</td>
<td>2</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>247</strong></td>
</tr>
</tbody>
</table>

*Table 4.2.* Total sample of Mimbres burials and represented sites.
Major Communities in the Sample

Sites with more than a few burials included in the sample have already been introduced in Chapter 2. The following addresses how burials were encountered and excavated at these featured sites. Also discussed are issues that have led to the present sample, particularly its representation and condition.

Harris

The Harris site is a well-known Late Pithouse period site in the north-central portion of the Mimbres Valley. As one of only a few sites without a Pueblo component, it has been the source of a wealth of early Mimbres occupational and cultural data and has been relatively untouched by looting. The site has been excavated twice, first by Emil Haury in 1934 (Haury 1936) and secondly by Barbara Roth who led a field school with the University of Nevada, Las Vegas from 2007-2013. Haury’s excavations focused on the southern portion of the site while Roth’s focused on the northern half. Both projects uncovered burials from pithouses, communal structures, and extramural areas. Burials excavated by Haury’s team were documented and collected for curation at the Peabody Museum at Harvard University where they were later analyzed. Because Haury’s objective in excavation was to define the Mogollon, his attention to structure form, ceramics, and burials was good and these were all documented in a way that could be useful to future scholars. Burials encountered by Roth’s team were excavated and analyzed in situ with subsequent reburial of the body and grave items. Extensive attention was paid to burials with a bioarchaeologist on site and the contextual data from these excavations is contributing to larger questions regarding social organization at the
Harris community. A total of 24 adult burials were included in this dataset, 16 of which were from Haury’s excavations and 8 of which were from Roth’s excavations.

**Galaz**

The Galaz site has been excavated on three separate occasions; the earliest by the Southwestern Museum of Los Angeles in 1927. It was excavated by Albert Jenks of the University of Minnesota between 1929 and 1931 and these excavations focused mostly on Pueblo period structures with the goal of collecting Mimbres ceramics. The Mimbres Foundation excavated primarily Pithouse period components from 1975 to 1977. Looting at the site was extensive throughout the 20th century, causing problems for both context and preservation of burials.

Altogether, 995 burials were excavated at Galaz (Anyon and LeBlanc 1984). The excavations by Jenks and the Mimbres Foundation both led to collection and curation of burials in repositories. Jenks excavated 451 burials and but, due to poor preservation, only a small portion of those were taken to be curated by the University of Minnesota. Unfortunately, bones with the best preservation were selectively chosen for curation so some burials were not brought back in a complete state. Several burials were thus represented only by a skull or the largest long bones.

In 1980, the human remains from the Galaz site were relocated to Hamline University in Saint Paul, Minnesota, where the State Archaeologist’s Office was based at the time. The burial goods associated with the Galaz human remains remained at the Weisman Museum in Minneapolis, resulting in split curation of the excavated collection. The human remains continue to be curated by the Anthropology Department at Hamline University.
University where this analysis took place. To date, only a few undergraduate and masters level research projects have included this skeletal collection (Bauer-Clapp 2005; Provinzano 1968). None of the results have been published. This research will likely be the first to publish data collected using this particular collection. A total of 31 adult burials from the Jenks Galaz excavations are included in this research.

Burials excavated by the Mimbres Foundation are curated at the Maxwell Museum at the University of New Mexico in Albuquerque. Their inventory reports 91 burials but only 8 adult burials were included in this dataset due to poor preservation and skeletal element representation. Altogether, this project’s research sample includes 39 adult burials from the Galaz site.

**Wind Mountain**

Excavation at Wind Mountain in the Mangas Valley of the Mimbres culture area was led by Charles DiPeso between 1977 and 1979 under the auspices of the Amerind Foundation. DiPeso and his team excavated domestic and ritual contexts and extramural areas that spanned from the Early Pithouse period to the Classic Mimbres phase of the Pueblo period. The majority of excavations included the Late Pithouse period however. Charles DiPeso unfortunately died prior to completion of analysis of the archaeological finds so reanalysis was done to write up the final site report (Woosley and McIntyre 1996).

The Wind Mountain burial assemblage included 122 inhumations and 2 cremations which were uncovered from domestic, ceremonial, and extramural areas. Burials were almost exclusively Pithouse period as only 4 individuals were buried with
Pueblo period ceramics (Woosley and Ravesloot 1993). Looting at the site was not extensive but did affect some burials. Like other sites, preservation of the skeletal remains was poor. Burials and artifacts have been curated by the Amerind Foundation since they were collected and that is where analysis of the skeletons took place for this project. Excluding the Wind Mountain report, no research using the human burial collection has been published to date. Like the Galaz burials curated in Minnesota, this research is likely to be the first to publish data from the Wind Mountain human remains. In total, 33 burials from Wind Mountain are included in this study.

**NAN Ranch Ruin**

NAN Ranch Ruin excavations resulted in one of the more systematic and well-documented burial assemblages for the entire Mimbres area. The site was briefly excavated by the Cosgroves in 1926 but wasn’t intensively excavated until Harry Shafer of Texas A&M University conducted field schools from 1978 to 1989 (with a few minor excavations in the 1990s). A thorough analysis of domestic and ceremonial structures from both the Pithouse and Pueblo periods was completed in addition to extramural areas (Shafer 2003). Mortuary context was recorded well and several studies have been completed using these burial data (Creel 1989; Ham 1989; Holliday 1993, 1996; Marek 1990; McGowan 2009; Shafer, et al. 1989).

Because of the systematic excavation by Shafer and the fact that looting was not as prominent at NAN Ranch as at other Mimbres sites, recovery of burials and their mortuary context was substantially better than at other sites. A total of 237 burials and 11 cremations were excavated and collected. Curation of the burials at Texas A&M
University continued until 2012 when the entire NAN Ranch collection was donated to the Western New Mexico University Museum in Silver City, New Mexico. Analysis of the adult burials took place there and a great deal of data was gathered due to the better preservation and reconstruction of skeletal remains. Several studies have been completed using these human remains (Adams 1999; Ham 1989; Holliday 1996; Marek 1990; McGowan 2009) and a few have been published (Creel 1989; Holliday 1993; Shafer, et al. 1989). A total of 66 burials are included in this dataset. The NAN Ranch burials comprise the largest subset of the entire research sample.

Cameron Creek

Cameron Creek is a Pithouse and Pueblo period site that was excavated by individuals from the Chino Copper Company and the Museum of New Mexico during the mid-1920s until Wesley Bradfield of the University of Minnesota completed excavations in 1928. Unfortunately, none of the excavations was very well documented. Bradfield (1929) did publish his findings but much of it is difficult to interpret, including the context of the 475 burials that were excavated.

Like the burials from Galaz collected by Jenks, the Cameron Creek burials excavated by Bradfield were selectively collected for curation at the University of Minnesota. The Peabody Museum curates selected burials from excavations that preceded Bradfield. Burials curated by the Peabody Museum were analyzed there. The University of Minnesota collection of Cameron Creek human remains was transferred to Hamline University in 1980 and burials were analyzed there for this project. The total number of burials included in this research sample is 21 but contextual data are
substantially lacking. Therefore, any results associated with these burials are unlikely to be able to contribute much to interpretation of broader Mimbres patterns. Instead, they present additional presence/absence information for some categories of data.

**Swarts**

The Swarts ruin was excavated between 1924 and 1927 by amateur archaeologists Charles and Hattie Cosgrove of Silver City, New Mexico, on behalf of the Peabody Museum at Harvard University (Cosgrove and Cosgrove 1932). Although minimally trained, they were ahead of their time in terms of conducting a thorough excavation and documentation of features uncovered. The Cosgroves were involved in minor excavations at multiple sites throughout the Mimbres region but their work at the Swarts site is most notable. The 1,010 burials at Swarts were recovered from both Late Pithouse period and Classic period structures including domestic and ceremonial contexts in addition to extramural areas (Cosgrove and Cosgrove 1932). Darrell Creel has been working on reconstructing temporal contexts of burials and this information is useful in providing more accurate information for the burials included in this project. The condition of the human remains was not good, therefore only a select few burials were collected for curation at the Peabody Museum. Of these burials, 19 adults are included in this study.

**Old Town**

Located at the southern region of the Mimbres River, the Old Town site features a long chronology of occupation from the Pithouse period into the Black Mountain phase of the Pueblo period (Creel 2006b). Excavation at the site was minimal and loosely
organized in the early half of the 20th century. The level of documentation and collection of artifacts from these endeavors varied. Creel (2006b) has documented as much of the excavation history as possible in his site report of Old Town which presents the findings of his excavations from 1989 to 2003. Extramural, domestic, and ceremonial areas were uncovered as a part of these excavations.

The Old Town site was extensively looted, making preservation very poor and burial context questionable. Although over 50 burials were encountered, only a few were collected for curation at the Texas Archaeological Research Laboratory at the University of Texas, Austin. Analysis of these resulted in the inclusion of six adult skeletons in this research dataset.

Mattocks

The Mattocks site in the heart of the Mimbres Valley was excavated first from 1929 to 1931 by Paul Nesbitt and his team from Beloit College in Beloit, Wisconsin, and then again by the Mimbres Foundation between 1974 and 1977 (Gilman 1990). Burials encountered during the latter excavation were often affected by looting, thus preservation was poor (Gilman 1990). Altogether, between 500 and 600 burials were excavated from domestic and ceremonial contexts at this primarily Classic period site. Nesbitt excavated between 239 and 267 burials (Gilman 1990) while the Mimbres Foundation excavated 293 burials. Condition of the remains was observed to be poor at the Maxwell Museum at the University of New Mexico in Albuquerque, where the latter collection of burials is curated and was analyzed. Because of this poor preservation, only 17 adults are ultimately included in this study.
Methodology

Bioarchaeological Reconstruction

Bioarchaeological reconstruction of the Mimbres burials included in this study permits interpretation of both the individual and the community. Both are important in understanding patterns of health, activity, and involvement in interpersonal conflict within communities and the region. How these patterns fluctuate with changing culture and physical environments is also important. The bioarchaeological reconstruction for this research incorporates demographic data and mortuary context from the burials.

Demography

Assessment of the demography of the sample involves estimation of the sex and age of each individual. Standard osteological techniques were employed for each determination. Sex was estimated using both cranial and post-cranial indicators. Age was estimated using pelvic morphological degradation and dental wear.

Sex Estimation

Non-metric cranial traits included the mastoid process, supraorbital brow ridge, supraorbital margin, nuchal crest, and nuchal crest. Each trait was scored for level of development/size on a 1 to 5 scale with 1 being the smallest development and indicating female, 3 being neither small nor large and indicating ambiguous, and 5 being the largest development and indicating male (Buikstra and Ubelaker 1994).

Non-metric post-cranial traits assessed included subpubic concavity, shape of pubic bone, presence of a ventral arc, and greater sciatic notch width (Buikstra and
Ubelaker 1994; Phenice 1969). The first three traits were scored as present or absent while the last was scored on a 1 to 5 scale similar to that of cranial traits.

Lastly, metric quantification of femoral and/or humeral heads was collected to estimate sex when cranial and pelvic non-metric indicators were lacking or were deemed ambiguous. For the humerus, vertical diameter of the head indicated female if less than 43mm and male if greater than 47mm (Stewart 1979). For the femur, vertical diameter of the head indicated female if less than 42.5mm and greater than 47.5mm (Stewart 1979).

Collectively, these traits and scores provided data to estimate sex for each individual skeleton. Because of the subjectivity in assessment of some of these traits, it is possible that some burials could be estimated as one sex in this study but the opposite sex in others carried out by other researchers. To account for this, the sex estimation for each individual assumes a level of confidence on the part of the researcher. Therefore, this study uses five sex determinations: Female, Probable Female, Indeterminate, Probable Male, and Male. Generally, however, the results are presented in terms of Female, Male, or Indeterminate.

*Age Estimation*

Estimation of age for each individual was done through assessment of degenerative changes on different areas of the skeleton. Two areas of the pelvis are most frequently utilized to gauge an approximate age at death. The first area is the pubic symphysis, the surface where both halves of the pelvis meet on the anterior side of the body. The second area is the auricular surface, where the os coxa meets the sacrum at the back of the pelvis.
Scoring pubic symphysis morphology was the primary method for aging Mimbres individuals. The technique involves scoring of the level of degeneration of the surface. Two scoring methods were utilized to increase accuracy (Brooks and Suchey 1990; Todd 1920). Both are based on the same premise of gradual wearing of the pubic symphyseal surface but each uses different numbers of phases of that wear. The Suchey-Brooks (Brooks and Suchey 1990) method uses six phases each for separate male and female samples while the Todd (1920) method uses ten phases for both sexes combined.

Age estimation using the auricular surface also relies on degenerative changes throughout the life course. The method by Lovejoy and colleagues (1985) presents eight phases of surface changes and break down. The technique works well in tandem with pubic symphysis aging to provide a more accurate age assessment. The developers of the method claim it is as accurate as pubic symphysis methodology and is a good alternate since the auricular surface is on a denser portion of the os coxa and therefore is more likely to preserve and withstand taphonomic processes (Lovejoy, et al. 1985).

Limitations do exist for both pubic symphysis and auricular surface aging techniques. There is a great deal of variation in the reference samples, therefore the range of ages that may qualify as a particular phase of degeneration is wide. The result is less accuracy in assigning a narrow age range to an individual based on a single phase of degeneration. Rather, a wider age range is more confident.

When skeletal indicators of age from the pelvis were not available, as was the case for many burials, an approximate age assessment was made using cranial indicators. Cranial sutures gradually come together and become fused over the life course. Using
the degree of fusion of the cranial sutures, age ranges could be estimated for each cranium. This method, however, is not as reliable as those relying on pelvic skeletal indicators (Meindl and Lovejoy 1985) and was only utilized when other aging techniques were not available due to preservation or representation of the skeletal elements. Two major limitations exist in this method. First, the cranium needs to be fairly complete or at least the sutures need to be well preserved. Second, the reference sample for this technique is not the same as Mimbres individuals and the range of variation that may exist between the two populations is unknown. Therefore, the level of accuracy for the age ranges provided in this process is also unknown. When possible, ages estimated via cranial suture closure were carried out in conjunction with one other technique.

The final aging technique utilized in this research considered the degree of wear on the occlusal (biting) surfaces of the teeth, particularly the molars. For populations such as the ancient Mimbres, abrasive particles in food processed with ground stone would permit a much higher rate of dental attrition than modern populations. As an individual experiences greater occlusal abrasion throughout their life, more attrition of the enamel occurs. Because the molars erupt approximately every six years, each sequential molar has less exposure to abrasive foods and materials. Thus, the first molar will typically have the most wear and the third molar will have the least (Brothwell 1965). Using this aging technique, the degree of occlusal attrition indicates a large approximate age range for the individual. Little to no wear suggests a younger adult individual less than 35 years while extensive wear suggests an older individual beyond 35
years (see Figure 4.1). The degree of dental wear, and thus approximate age, was assessed for all Mimbres burials with dentition present.

![Age span] 17-25 | 25-35 | 35-45 | 45+
---|---|---|---
M1 | M1 | M1 | More advanced wear
M2 | M2 | M2 | wear
M3 | M3 | M3 | pattern

**Figure 4.1.** Aging technique based on degree of occlusal wear. From Brothwell 1965.

For the purposes of this study, dental wear and all other skeletal indicators of age were assessed to place an individual into one of two age categories: young adult and old adult\(^2\). The young adult category includes those whose skeletal development was near or at completion and with a chronological age of approximately 17 to 35 years. The old adult category includes those individuals who have completed growth and are represented by mature skeletons. These skeletons demonstrate slight to severe degeneration and a chronological age greater than 35 years.

**Biocultural Identity**

Interpreting the biocultural identity of each individual is important for this study because it permits assessment of the health and lived experience of Mimbres.

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\(^2\) The original intent of this project was to use an additional ‘middle adult’ age category representing 35-50 year olds but preservation issues hampered age estimations. Thus, middle and old adults were combined into a single age category to permit meaningful data analysis and comparison.
communities and subsets of communities. These experiences, in turn, reveal information about how people interacted with one another and their environment. The following sections discuss methods used to uncover biological responses to Mimbres life.

**Nutrition**

A biocultural approach to analysis such as that being utilized in this study means that both biological and cultural factors are considered in interpreting the human skeletal remains. Assessing nutrition for an individual or group of individuals can be accomplished by estimating stature. One’s stature as an adult reflects their ability to physically grow and mature throughout their growth period (i.e., childhood). Research of prehistoric skeletal remains from numerous contexts has demonstrated that growth potential can be impacted by nutrition and biological stressors ranging from weaning to disease (Goodman and Armelagos 1989; Jantz and Owsley 2005; Martin and Akins 2001; Pinhasi, et al. 2011; Saunders and Hoppa 1993; VanGerven, et al. 1985). For example, lack of access to resources in either quantity or quality could inhibit growth of the skeleton and other organ systems as vital nutrients must be consumed to ensure proper biological function (Goodman and Armelagos 1989; Saunders and Hoppa 1993). Therefore observations of differential stature within a skeletal sample can be indicative of social disparities within the population which can then be examined using other archaeological and cultural contexts.

Stature was estimated for Mimbres burials using regression formulae for long bone length developed by Genovés (1967) based on a sample of skeletal remains from Mexico. The formulae were later updated by del Angel and Cisneros (2004) and used in
this study. Although the reference sample is not identical to the Mimbres, this method has been determined to be the most suitable proxy for calculation of stature for ancient Southwest populations (Auerbach and Ruff 2010). Using length of the femur, tibia, and humerus, stature was calculated for each sex with the following formulae:

<table>
<thead>
<tr>
<th></th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>63.89 + 2.262(femur)</td>
<td>47.25 + 2.588(femur)</td>
</tr>
<tr>
<td></td>
<td>91.26 + 1.958(tibia)</td>
<td>61.29 + 2.720(tibia)</td>
</tr>
<tr>
<td></td>
<td>83.52 + 2.505(humerus)</td>
<td>32.35 + 4.160(humerus)</td>
</tr>
</tbody>
</table>

**Activity-Related Changes**

Skeletal adaptation to activity and habitual physical stress can be observed in the attachment sites of muscles: “entheses”. Entheses serve to anchor tendons and ligaments to the bone and to stabilize movement (Benjamin, et al. 2006). As muscles are used to carry out different activities, the mechanical loading on those attachment sites causes an osteological reaction in which the bone cells build up at the enthesis so that it can support the stress applied to the muscle (Mariotti, et al. 2007). Entheses have also been referred to as musculoskeletal stress markers (MSMs) (Hawkey and Merbs 1995). Early research on MSMs by Hawkey and Merbs (1995) sought to identify patterned differences in activity by documenting the degree of development for a population over time. This work promoted assessment of specific tasks based on MSM scores but this process has since been discouraged. Instead, researchers have condoned the use of entheses/MSMs to discuss general anatomical actions that might indicate broader patterns in division of labor of sample populations (Foster, et al. 2014; Jurmain, et al. 2012; Robb 1998).
has been a limitation for the degree with which entheseal development can be used in bioarchaeological analysis. The only other major limitation is the effect of age on entheses scoring. Greater age has been positively correlated with more robust enthesis development, therefore the process of assessing entheses loses effectiveness for older age groups (Cardoso and Henderson 2010; Foster, et al. 2014; Jurmain, et al. 2012; Mariotti, et al. 2007; Milella, et al. 2012; Robb 1998).

For this analysis, entheses were examined for level of development and robusticity using standardized scoring by Mariotti and colleagues (2007). Scores ranged from 1 (slight development) to 3 (very high development) and were made using comparative photographs and descriptions from the original study (see Appendix I for data form used). Sites scored were on major long bones including the humerus, ulna, radius, femur, and tibia. Table 4.3 lists specific entheses that were scored for the study.

<table>
<thead>
<tr>
<th>Bone</th>
<th>Enthesis</th>
<th>Musculoskeletal Marker</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humerus</td>
<td>Pectoralis major</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Deltoideus</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Brachioradialis</td>
<td></td>
</tr>
<tr>
<td>Ulna</td>
<td>Triceps brachii</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Brachialis</td>
<td></td>
</tr>
<tr>
<td>Radius</td>
<td>Biceps brachii</td>
<td>N/A</td>
</tr>
<tr>
<td>Femur</td>
<td>Gluteus maximus</td>
<td>Poirier's Facet</td>
</tr>
<tr>
<td></td>
<td>Iliopsoas</td>
<td>Posterior Cervical Imprint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Peritrochlear Groove</td>
</tr>
<tr>
<td>Tibia</td>
<td>Quadriceps tendon</td>
<td>Squatting Facets</td>
</tr>
<tr>
<td>Sacrum</td>
<td>N/A</td>
<td>Accessory Facets</td>
</tr>
</tbody>
</table>

*Table 4.3* Entheses and MSMs scored in analysis.
In addition to entheses, select musculoskeletal stress markers were scored as present or absent on the femur, tibia, and sacrum (see Table 4.3 and Appendix I). These included sites that could provide additional information regarding habitual stress and mechanical loading on the lower limbs and pelvis. Analysis of these MSMs was based on research by Capasso and colleagues (1999).

Robusticity indices are also useful in determining activity levels of the sample, much like entheses and musculoskeletal stress markers. Robusticity indices indicate cross-sectional morphology of the bone and thus inform the researcher about the mechanical loading and strength of the bone (Stock and Shaw 2007). Indices were calculated using metric measurements of the humerus and the femur using the following formulae from Bass (2005):

<table>
<thead>
<tr>
<th></th>
<th><strong>Femur</strong></th>
<th><strong>Humerus</strong></th>
</tr>
</thead>
</table>
| **Formula**    | \[
\frac{\text{anterior-posterior + mediolateral diameter of midshaft \times 100}}{\text{bicondylar (physiological length)}}
\] | \[
\frac{\text{least circumference of shaft \times 100}}{\text{maximum length of humerus}}
\] |

**Health**

Health and wellness among individuals and communities in the Mimbres region were explored using indicators of disease and traumatic injury. Because this study sought to understand a broad health status, basic pathological processes were documented. These included general periosteal reactions (or periostitis) on long bones and cribra orbitalia and porotic hyperostosis on the cranium.
Periosteal reactions are useful in identifying some form of insult to the bone or nearby tissues. This could include injury to the area or a larger disease process or bacteria that affects several body systems (Aufderheide and Rodríguez-Martin 2003; Ortner 2003). Periostitis appears as a layer of woven bone on the external surface of the bone and is caused by inflammation of the bony tissue (Ortner 2003). It is most commonly found on the anterior shafts of tibiae (Roberts and Manchester 2005). For this research, observed periostitis was documented for bone affected, size of area affected (localized or generalized across the whole bone surface), and degree of healing (none to complete).

Cribra orbitalia and porotic hyperostosis are pathological responses in the body that can result from inflammatory or hemorrhagic processes as well as dietary orders such as anemia (Aufderheide and Rodríguez-Martin 2003; Ortner 2003). These pathologies appear as porous bone on the eye orbit (cribra orbitalia) and the cranial vault (porotic hyperostosis) which can also become thick (Ortner 2003). Like periostitis, observations of this pathology were documented for location and degree of healing.

Trauma

Traumatic injuries were observed and documented with regard to location on the skeleton (cranial or post-cranial) and timing of the injury (antemortem or perimortem interval). Both factors are important for interpreting the likelihood that an injury was associated with interpersonal violence rather than accident or occupation. Research has shown that cranial injuries, especially those above the ‘hat-brim line’ (see Figure 4.2), are more frequently the result of violent encounters in which the perpetrator seeks to harm
the victim by striking the cranial vault or face (Ehrlich and Maxeiner 2002; Guyomarc’h, et al. 2010; Kremer, et al. 2008; Kremer and Sauvageau 2009). Injuries within the hat brim line can be violent in origin or the result of accident (Guyomarc’h, et al. 2010; Kremer, et al. 2008).

Cranial depression fractures (CDFs) are commonly observed as the result of interpersonal conflict. These injuries occur when a blunt object strikes the cranial vault and an area of the bone becomes depressed and fractured (Galloway 1999). The resulting defect can range in severity from minor fracturing to complete detachment of a portion of the cranial bone. There can be linear fractures radiating from the impact site when the

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Figure 4.2. The “hat brim line”. From Guyomarch et al. 2010.
blunt object is traveling at a low velocity but high velocity impacts will more frequently result in depressed fractures (CDFs) (Galloway 1999). While blunt force cranial trauma can be fatal, the victim is capable of surviving and recovering from the most severe forms of injury. When this happens, the bone begins to heal and the CDF is remodeled over time, leaving a permanent mark of the event.

Documentation of CDFs in this study involved notation of placement on the cranium, metric measurements of the length and width to indicate size, and metric measurement of the depth at the deepest point to indicate severity of the injury. Degree of healing was also documented to infer the injury’s association or lack of involvement in the victim’s death and therefore relevance to violent conflict. Healing was scored on a scale of 0 to 3 with 0 indicating no healing (a perimortem injury) and 3 indicating completion of healing (an antemortem injury). Fully healed cranial CDFs would indicate that the injuries took place long before the death of the individual while partially healed or unhealed CDFs would suggest potential correlation between the injury and death. Facial injuries were also documented to assess interpersonal conflict. Fractures of the nose, eyes, and mouth were noted for degree of healing and severity.

Post-cranial injuries are common results of accidents but can also be associated with violent confrontation (Galloway 1999; Lovell 1997). Injuries to the distal forearms (wrist area), are often the result of bracing for impact in a fall (Judd 2008; Lovell 1997). Fractures to the forearm (particularly the ulna) on the anterior side are known as parry fractures and can be related to violent confrontation as they typically represent defensive blocking of an attack toward the face (Judd 2008; Lovell 1997). Injuries to the legs are
commonly associated with falls and this generally increases with greater age (Galloway 1999). Post-cranial injuries were documented for each individual. Location and degree of healing were documented similarly to cranial injuries.

Summary

The previous methodology has been outlined to guide the reader through the objectives of this research. Through bioarchaeological reconstruction and biocultural identity for each burial, the Mimbres culture is examined in a way that reveals information about each individual as well as the larger community. Collectively, these data provide insight into interpersonal and group interactions and can help answer questions regarding Mimbres social organization.
CHAPTER 5  
DEMOGRAPHIC AND BIOCULTURAL FEATURES OF MIMBRES COMMUNITY  
LIFE AND PERSONAL INTERACTION  

The results of the bioarchaeological analysis of the Mimbres skeletal remains are presented here. Following the structure of the methodology described in the previous chapter, the findings are reported for bioarchaeological reconstruction followed by biocultural identity with regard to the sample as a whole and subsamples (e.g., individual sites, age groups, etc.). Selected burials are occasionally highlighted to illustrate specific findings.  

Bioarchaeological Reconstruction  
Analysis of all available Mimbres burials was conducted and this included the in situ analysis at one active excavation (the Harris site) as well as numerous museum and university repositories. A total of 247 adult burials representing 18 communities were included in the research sample (Table 5.1). The largest number of individuals (66) came from NAN Ranch Ruin. Galaz, Wind Mountain, and Harris also were represented by a large number of individuals.  

Demography  
The estimation of biological sex and age-at-death for each individual was often complicated by the poor preservation and under-representation of skeletal elements.
Every effort was made to determine basic demographic data for each burial in the sample. As is seen in Table 5.1 and Figure 5.1, most individuals were able to be assigned a sex. Males and females are almost equally represented, and only 10 individuals were too fragmentary or under-represented to determine sex.

<table>
<thead>
<tr>
<th>Site</th>
<th>Males</th>
<th>Females</th>
<th>Indeterminate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bradsby</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Cameron Creek</td>
<td>14</td>
<td>7</td>
<td>0</td>
<td>21</td>
</tr>
<tr>
<td>Disert</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Galaz</td>
<td>17</td>
<td>20</td>
<td>2</td>
<td>39</td>
</tr>
<tr>
<td>Harris</td>
<td>11</td>
<td>13</td>
<td>0</td>
<td>24</td>
</tr>
<tr>
<td>Mattocks</td>
<td>6</td>
<td>9</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>Mitchell</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Montoya</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>NAN Ranch Ruin</td>
<td>32</td>
<td>32</td>
<td>2</td>
<td>66</td>
</tr>
<tr>
<td>Old Town</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Swarts</td>
<td>12</td>
<td>6</td>
<td>1</td>
<td>19</td>
</tr>
<tr>
<td>Treasure Hill</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Walsh</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Wheaton-Smith</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Wind Mountain</td>
<td>11</td>
<td>19</td>
<td>3</td>
<td>33</td>
</tr>
<tr>
<td>Z.14.20A</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Z.14.20B</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>LA 18839</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>116</td>
<td>121</td>
<td>10</td>
<td>247</td>
</tr>
</tbody>
</table>

*Table 5.1.* Research sample organized by site and sex, alphabetically.

Sites represented by more than 15 burials were generally equal in the distribution of males and females. Cameron Creek and Swarts, however, had twice as many males as
females while Wind Mountain had almost twice as many females as males. Excavation and preservation issues at Cameron Creek and Swarts are likely contributory to the differential sex distribution (Creel 2015, personal communication). Wind Mountain was fairly thoroughly excavated, so the higher proportion of females may be significant (Woosley and McIntyre 1996).

![Sex Representation]

*Figure 5.1. Sex breakdown of skeletal sample.*

Age distribution of burials is presented for the combined sample in Table 5.2. Every effort was made to estimate age at death using all available skeletal and dental indicators. While the goal in this methodology was to assign each skeleton to an age category, preservation and skeletal representation was a complicating factor. Therefore, some individuals could only be stated to be “Adult” and no further refinement could be made. Preservation issues also impacted the accuracy in estimating adults into Middle
Adult (35-49 years) and Old Adult (greater than 50 years) categories. Occasionally individuals were able to be aged beyond the Young Adult category (15-34 years) but not so specifically that the Middle and Old categories could be differentiated. These latter two categories were collapsed and the sample was therefore assessed according to two age groups: Young Adult (15-34 years) and Old Adult (greater than 35 years).

<table>
<thead>
<tr>
<th>Sex</th>
<th>Young Adult</th>
<th>Old Adult</th>
<th>Adult</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>21</td>
<td>80</td>
<td>15</td>
<td>116</td>
</tr>
<tr>
<td>Female</td>
<td>45</td>
<td>63</td>
<td>13</td>
<td>121</td>
</tr>
<tr>
<td>Indeterminate</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>68</strong></td>
<td><strong>145</strong></td>
<td><strong>34</strong></td>
<td><strong>247</strong></td>
</tr>
</tbody>
</table>

*Table 5.2. Demographic breakdown of sample by sex and age category.*

Older adults in the sample outnumber young adults two to one. This demographic distribution is expected given higher morbidity and allostatic processes differentially affecting adults the older they get. The finding of twice the number of young adult females compared to young adult males in the overall sample is either due to sample bias, or to factors that contribute to young adult female morbidity and mortality. It is possible that young adult females died at greater rates due to higher morbidity. Given the potential for sample bias, combined with the results of health analysis (presented later in this chapter), the over-abundance of females in the sample may or may not represent a real trend.

**Chronological Representation**
Individuals in the sample come from time periods representing the chronology of Mimbres culture (see Table 5.3). A total of 60 individuals were associated with the Pithouse period, particularly the Late Pithouse (AD 550-1000) period. The Pueblo period was represented by 107 individuals, of which most were associated with the Classic (AD 1000-1150) period. Unfortunately, 80 burials in the sample cannot be associated with a particular time period within the Mimbres chronology. Given the excavation procedures at the sites where most of these burials were excavated, 27 of them are likely from the Classic period and 3 are likely from the Late Pithouse period. The remaining 50 burials have unknown temporal association and this is mostly attributed to poor contextual data and a lack of excavation documentation during the early 20th century. Every effort was made to accurately categorize the burials with regard to temporal period using all contextual information from burial records and archaeological excavation details.
Biocultural Identity

Each individual was analyzed for skeletal markers of their lived experiences. Through an examination of nutrition adequacy, activity-related changes in the skeleton, health status, and cases of trauma, a biocultural identity was interpreted for each individual in the sample. These data indicate patterns of exposure to various forms of stress and also assist in the examination of interpersonal violence and warfare in Mimbres communities.

Nutritional Adequacy

Nutritional adequacy over the life course of each individual was estimated by their achieved stature at adulthood. Regression formulae were used to calculate stature based on maximum lengths of the femur, tibia, or humerus. Every effort was made to use

<table>
<thead>
<tr>
<th>Site</th>
<th>Pithouse</th>
<th>Pueblo (Likely Classic)</th>
<th>Unassigned (Likely Classic)</th>
<th>Unassigned (Likely Pithouse)</th>
<th>Unknown</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bradsby</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Cameron Creek</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>Disert</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Galaz</td>
<td>3</td>
<td>17</td>
<td>15</td>
<td>0</td>
<td>4</td>
<td>39</td>
</tr>
<tr>
<td>Harris</td>
<td>24</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>24</td>
</tr>
<tr>
<td>Mattocks</td>
<td>0</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>17</td>
</tr>
<tr>
<td>Mitchell</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Montoya</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>NAN Ranch Ruin</td>
<td>11</td>
<td>55</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>66</td>
</tr>
<tr>
<td>Old Town</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Swarts</td>
<td>0</td>
<td>7</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>19</td>
</tr>
<tr>
<td>Treasure Hill</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Walsh</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Wheaton-Smith</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Wind Mountain</td>
<td>19</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>10</td>
<td>33</td>
</tr>
<tr>
<td>Z.14.20A</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Z.14.20B</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>LA 18839</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>TOTAL</td>
<td>60</td>
<td>107</td>
<td>27</td>
<td>3</td>
<td>50</td>
<td>247</td>
</tr>
</tbody>
</table>

*Table 5.3. Temporal distribution of burials at each site.*
the femur when available and preserved. Tibia length was the next preferred measurement and humerus length was the final option for calculating stature if neither of the former bones yielded usable measurements.

Sex determination was necessary for stature calculation due to sex-specific regression formulae. Because of this, some individuals in the sample (those with indeterminate sex) were not included in stature assessment for the dataset as a whole. Stature was calculated for a total of 46 males and 47 females³ (see Table 5.4). Mimbres males had a mean stature of 162.23cm (approximately 5 ft. 4 in.) while females had a mean stature of 153.26cm (approximately 5 ft. 0 in.).

<table>
<thead>
<tr>
<th>Sex</th>
<th>Mean</th>
<th>N</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>162.23cm</td>
<td>46</td>
<td>3.61</td>
</tr>
<tr>
<td>Females</td>
<td>153.26cm</td>
<td>47</td>
<td>4.89</td>
</tr>
</tbody>
</table>

*Table 5.4. Mean stature for males and females.*

Individuals were also examined by temporal assignment to understand possible changes in achieved stature over time. Temporal assignment was unknown for some burials and this eliminated those individuals from the analysis. A total of 23 Pithouse burials and 51 Pueblo burials were compared for temporal change in stature (see Table 5.5). Mean stature decreased slightly for males after the Pithouse period but increased

³ Stature is typically reported as an approximate range to accommodate standard deviation from the mean. For the purposes of this study, only mean stature is reported so that comparison with other datasets is more manageable. This is consistent with reporting styles of other scholars.
slightly for females. This could potentially reflect better availability of nutritional resources for each sex in the periods of greater stature. Alternatively, it could be the result of population variability during each time period.

Table 5.5. Mean stature for males and females for Pithouse and Pueblo time periods.

<table>
<thead>
<tr>
<th></th>
<th>Pithouse</th>
<th>Pueblo</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td><strong>Mean</strong></td>
<td><strong>N</strong></td>
</tr>
<tr>
<td>Male</td>
<td>162.89cm</td>
<td>9</td>
</tr>
<tr>
<td>Female</td>
<td>152.81cm</td>
<td>14</td>
</tr>
</tbody>
</table>

Males and females from the communities with the largest samples (Galaz, Harris, NAN Ranch, and Wind Mountain) were examined for mean stature (see Table 5.6). Males at each of the four sites are close to the mean stature of the whole sample (162.23cm); however those at Wind Mountain (at 164.95cm) are, on average, somewhat taller than other males (see Figure 5.2). Females at these four sites were also close to the mean stature for the whole sample (153.26cm) (see Figure 5.3). Females at Galaz were the tallest on average at 153.99cm. Differences in mean stature for males among the four sites were not statistically significant (p=.257, df=3, Kruskal-Wallis, independent samples test). Differences in mean stature for females among the four sites were also not statistically significant (p=.570, df=3, Kruskal-Wallis, independent samples test).
Table 5.6. Mean stature for males and females at communities with largest samples.

<table>
<thead>
<tr>
<th>Site</th>
<th>Males</th>
<th>N</th>
<th>Standard Deviation</th>
<th>Females</th>
<th>N</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Galaz</td>
<td>163.24cm</td>
<td>10</td>
<td>2.81</td>
<td>153.99cm</td>
<td>9</td>
<td>3.08</td>
</tr>
<tr>
<td>Harris</td>
<td>162.27cm</td>
<td>3</td>
<td>2.61</td>
<td>151.13cm</td>
<td>4</td>
<td>3.25</td>
</tr>
<tr>
<td>NAN Ranch Ruin</td>
<td>161.70cm</td>
<td>15</td>
<td>3.64</td>
<td>152.51cm</td>
<td>15</td>
<td>6.20</td>
</tr>
<tr>
<td>Wind Mountain</td>
<td>164.95cm</td>
<td>4</td>
<td>3.67</td>
<td>151.62cm</td>
<td>9</td>
<td>3.37</td>
</tr>
</tbody>
</table>

Figure 5.2. Variation in mean stature for males at Mimbres communities with largest samples.
The results of Mimbres stature analysis reveal that males and females were able to sustain growth due to an adequate nutrient intake. The greater stature observed among males is typical for agricultural groups and the heights of both Mimbres males and females are within normal range for pre-contact groups in the American Southwest (Auerbach 2011; Martin, et al. 1991). These data demonstrate that Mimbres populations were able to thrive in their environment throughout their early and late occupations.

**Activity-Related Changes**

Enthesal development and robusticity (the site of muscle attachments on bone) were both assessed to determine physicality (e.g., physical strength and development) among Mimbres communities. Scoring of entheses was difficult for some individuals due to poor preservation of long bones; but for those that could be confidently scored, a
systematic method permitted comparison within Mimbres groups as well as with published data for other prehistoric groups. Results of both observations are presented with reference to sex and temporal assignment as well as community differences.

*Entheseal Development*

Mean entheses scores for upper and lower extremities are presented in Tables 5.7 and 5.8. Development of upper and lower extremity entheses increases for the old adults (those greater than 35 years of age) for both sexes throughout the Mimbres cultural sequence. These results are expected given that these kinds of indicators are age related, and greater robusticity is typically observed among older populations (discussed in Chapter 4). Males, in general, tend to exhibit more enthesal development with age than do females. As a whole, the sample demonstrates similar muscular robusticity for both males and females (see Table 5.7). While a sexual division of labor would have meant that males and females were doing different activities, the data indicate that both sexes experienced similar enthesal development in their upper and lower extremities.

<table>
<thead>
<tr>
<th>Sex</th>
<th>Young Adult</th>
<th>N</th>
<th>Standard Deviation</th>
<th>Old Adult</th>
<th>N</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>1.27</td>
<td>12</td>
<td>0.25</td>
<td>1.76</td>
<td>55</td>
<td>0.58</td>
</tr>
<tr>
<td>Females</td>
<td>1.25</td>
<td>33</td>
<td>0.30</td>
<td>1.58</td>
<td>48</td>
<td>0.49</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sex</th>
<th>Young Adult</th>
<th>N</th>
<th>Standard Deviation</th>
<th>Old Adult</th>
<th>N</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>1.60</td>
<td>10</td>
<td>0.42</td>
<td>2.16</td>
<td>55</td>
<td>0.54</td>
</tr>
<tr>
<td>Females</td>
<td>1.44</td>
<td>31</td>
<td>0.66</td>
<td>1.74</td>
<td>48</td>
<td>0.59</td>
</tr>
</tbody>
</table>

*Table. 5.7.* Mean entheses development scores for sex and age groups in the sample.
Table 5.8. Mean entheses development scores for sex and age groups through the Mimbres chronology.

When examined by time period, the differences between sexes are more noticeable but they are not extreme. Compared to the Pithouse period, young adult males in the Pueblo period showed decreased enthesial development for both extremities. Older adults, however, maintained higher enthesal development during both the Pithouse and Pueblo periods.

Comparison of entheses scores at the four largest sampled communities revealed similarities in development for each site. Differences observed within sex groups (see Table 5.9) are typically reconciled by age representation of each community sample (see Table 5.10). For example, upper extremity scores of females at the Harris site (1.71) are somewhat greater than that of the females in the other three communities (1.39-1.48). The fact that Harris females (n=7) were all older explains a larger mean score while the smaller mean scores from the other sites reflect both young and older females at those sites.
For lower extremity scores among females, the lowest observed mean score was among the NAN Ranch Ruin sample (1.57 compared to 1.73-1.87 for the other three samples). With the exception of the Harris sample, each site sample is represented by similar numbers of both young and older females. Interestingly, the older females at NAN Ranch Ruin had lower scores than females for lower extremity entheses. This was not the case among males at NAN Ranch Ruin. This observation suggests that females at the site may have engaged in decreased physical activity involving the lower extremities as they aged. The effect of age among the females of other site samples is more pronounced, especially at Wind Mountain where the mean score of old females was 0.84 greater than that of young females (see Table 5.10). At that site, perhaps a combination of age and greater physical demands associated with the ridge top location of the community contributed to higher mean enthesal development of the lower extremities.

<table>
<thead>
<tr>
<th>Site</th>
<th>Upper Extremities</th>
<th></th>
<th></th>
<th></th>
<th>Lower Extremities</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Males (N)</td>
<td></td>
<td></td>
<td></td>
<td>Males (N)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Standard Deviation</td>
<td></td>
<td></td>
<td></td>
<td>Standard Deviation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Females (N)</td>
<td></td>
<td></td>
<td></td>
<td>Females (N)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Standard Deviation</td>
<td></td>
<td></td>
<td></td>
<td>Standard Deviation</td>
<td></td>
</tr>
<tr>
<td>Galaz</td>
<td>1.58 (9)</td>
<td>1.39 (15)</td>
<td></td>
<td></td>
<td>2.17 (9)</td>
<td>1.79 (12)</td>
</tr>
<tr>
<td></td>
<td>0.32</td>
<td>0.30</td>
<td></td>
<td></td>
<td>0.45</td>
<td>0.75</td>
</tr>
<tr>
<td>Harris</td>
<td>1.46 (6)</td>
<td>1.71 (7)</td>
<td></td>
<td></td>
<td>1.78 (5)</td>
<td>1.73 (7)</td>
</tr>
<tr>
<td></td>
<td>0.65</td>
<td>0.41</td>
<td></td>
<td></td>
<td>0.60</td>
<td>0.51</td>
</tr>
<tr>
<td>NAN Ranch Ruin</td>
<td>1.76 (27)</td>
<td>1.43 (29)</td>
<td></td>
<td></td>
<td>2.03 (27)</td>
<td>1.57 (29)</td>
</tr>
<tr>
<td></td>
<td>0.65</td>
<td>0.56</td>
<td></td>
<td></td>
<td>0.47</td>
<td>0.52</td>
</tr>
<tr>
<td>Wind Mountain</td>
<td>1.75 (9)</td>
<td>1.48 (18)</td>
<td></td>
<td></td>
<td>2.37 (9)</td>
<td>1.87 (19)</td>
</tr>
<tr>
<td></td>
<td>0.53</td>
<td>0.38</td>
<td></td>
<td></td>
<td>0.63</td>
<td>0.73</td>
</tr>
</tbody>
</table>

Table 5.9. Mean entheses development scores for the four largest sampled communities.
Table 5.10. Mean entheses development scores for females and males in the four largest sampled communities.

<table>
<thead>
<tr>
<th>Site</th>
<th>Females</th>
<th></th>
<th></th>
<th>Males</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Young n</td>
<td>Old n</td>
<td>Young n</td>
<td>Old n</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Galaz</td>
<td>1.24</td>
<td>1.48</td>
<td>1.25</td>
<td>1.64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harris</td>
<td>n/a</td>
<td>1.67</td>
<td>1.58</td>
<td>1.56</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NAN Ranch Ruin</td>
<td>1.31</td>
<td>1.60</td>
<td>1.14</td>
<td>1.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wind Mountain</td>
<td>1.20</td>
<td>1.79</td>
<td>n/a</td>
<td>1.79</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Overall, the entheseral development of all Mimbres individuals is not considered extreme by the published results from other studies using the same methods. Nearly all mean entheses scores are between 1 and 2 which correspond to slight to moderate development but not very high (scored as a 3). The only subsample scores greater than 2 were among lower extremities of older adult males. Muscular development appears similar for all subsamples and no major patterns are present to suggest substantial workloads or sexual dimorphism within the division of labor in the Mimbres region.

Robusticity Indices

Using measurements of complete femora and humerii, robusticity indices were calculated to document bone strength and overall physicality among Mimbres
communities. Results for the sample as a whole are presented in Table 5.11 for humeral robusticity and Table 5.13 for femoral robusticity. Tables 5.12 and 5.14 present the results for the same bones but with reference to temporal assignment. Because temporal assignment was unknown for many burials in the sample, the results presented in these tables reflect smaller samples.

The robusticity index reflects the mechanical loading of the respective bone and thus can demonstrate differential workloads between sexes or samples.

**Humerus.** Mean humeral robusticity indices for Mimbres males and females demonstrate greater overall development among males however the mean scores are both within the ranges of indices for the opposite sex (see Table 5.11). Comparison of humerus indices during each cultural time period demonstrates greater physical development in the later Pueblo period for both males and females (see Table 5.12). The smaller subsample size of each sex during the Pithouse period, however, may contribute to this finding. Each subsample is represented by a fairly even mix of young and older individuals however Pueblo period males are represented by many more old than young individuals. This may also have impacted the larger mean humeral index although the standard deviation is lower, suggesting that Pueblo period males were more consistent with one another in humeral development than were other subsamples in each time period.
Robusticity indices using the femur are presented for all available individuals in the sample. Like the humerus, results demonstrate greater physical development of males (see Table 5.13) however the degree of difference in indices is smaller. Greater femoral robusticity is observed for males in both cultural time periods as well (see Table 5.14) but the difference may not be statistically significant. Sample size for males and females in the Pithouse period is too small to make meaningful and reliable comparisons; therefore the observed decrease in femoral robusticity indices during the Pueblo period will not be addressed.
Comparison of robusticity indices at the four communities with the most numerous samples demonstrated that males consistently had more developed humerii and femora than females (see Tables 5.15 and 5.16). For each bone, however, males and females were both similar to one another in mean robusticity. Thus, no major differences in physicality are observed between sites or between the sexes. The similarity in robusticity between sexes (i.e., a lack of sexual dimorphism) does prompt consideration of gender roles in labor organization at Mimbres communities. This will be addressed in the following chapter.
Health

The Mimbres skeletal sample demonstrates generally good health overall as observations of disease processes were minimal. Only two older females had periosteal reactions, both of which were localized to a single bone. No individuals exhibited evidence of systemic infection of any kind. Analysis of cranial remains revealed low rates of cribra orbitalia and porotic hyperostosis as well (see Table 5.17); one male and one female demonstrated cribra orbitalia and three males and three females demonstrated porotic hyperostosis. These findings corroborate the stature results and suggest that diet was adequate for Mimbres communities as both disease processes are correlated with nutritional deficiencies.

Table 5.15. Mean humeral robusticity indices for males and females for the four largest sampled communities.

<table>
<thead>
<tr>
<th>Site</th>
<th>Males N</th>
<th>Standard Deviation</th>
<th>Females N</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Galaz</td>
<td>18.72 7</td>
<td>1.22</td>
<td>18.64 7</td>
<td>0.68</td>
</tr>
<tr>
<td>Harris</td>
<td>19.10 1</td>
<td>N/A</td>
<td>17.84 2</td>
<td>0.64</td>
</tr>
<tr>
<td>NAN Ranch Ruin</td>
<td>19.12 9</td>
<td>1.11</td>
<td>18.27 10</td>
<td>1.33</td>
</tr>
<tr>
<td>Wind Mountain</td>
<td>19.22 3</td>
<td>0.36</td>
<td>17.69 4</td>
<td>1.66</td>
</tr>
</tbody>
</table>

Table 5.16. Mean femoral robusticity indices for males and females for the four largest sampled communities.

<table>
<thead>
<tr>
<th>Site</th>
<th>Males N</th>
<th>Standard Deviation</th>
<th>Females N</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Galaz</td>
<td>12.60 2</td>
<td>0.33</td>
<td>11.93 7</td>
<td>0.32</td>
</tr>
<tr>
<td>Harris</td>
<td>12.67 2</td>
<td>0.58</td>
<td>N/A 0</td>
<td>N/A</td>
</tr>
<tr>
<td>NAN Ranch Ruin</td>
<td>12.51 8</td>
<td>1.2</td>
<td>12.27 7</td>
<td>0.82</td>
</tr>
<tr>
<td>Wind Mountain</td>
<td>N/A 0</td>
<td>N/A</td>
<td>12.07 4</td>
<td>0.35</td>
</tr>
</tbody>
</table>
Other pathologies observed were indicative of isolated events such as abscessed teeth that developed into maxillary infections or osteochondritis dessicans (a common problem of disintegrating cartilage in joint systems). Osteoarthritis was slight among most older individuals although a few could be described as having moderate arthritic development. Dental pathologies included caries and abscesses but overall dental health seemed well within the low to normal range for pre-contact agriculturalists (Larsen 1997). Antemortem loss of molars was commonly observed in older adults but this is not unusual for a prehistoric Southwest population given their high consumption of maize (a cariogenic food source) and use of ground stone (which could contribute to grit in foods) to process foods (Adams 1999).

### Trauma

The analysis of trauma included both lethal and nonlethal injuries and attempted to assess the role of interpersonal violence in Mimbres communities. Trauma is reported with respect to cranial or post-cranial manifestations, and by sex of the individual, age at death, time period, and site. Injuries are also presented with regard to severity and healing.
Cranial Trauma

Injuries to the crania were almost exclusively small, nonlethal depression fractures. Of the 247 individuals with crania present examined, 26 (11%) had at least one nonlethal cranial depression fracture (CDF) and an additional individual had a linear radiating fracture resulting from a blow to the head that was likely lethal. The majority of CDFs were observed among males (n=19) but females (n=6) also had them, as did a single individual whose sex was indeterminate (see Table 5.18). Of the 26 individuals with CDFs, three males (1 from Galaz and 2 from NAN Ranch Ruin) had two CDFs and one male from Wind Mountain had three CDFs. None of these males were young. No females had multiple cranial depression fractures.

<table>
<thead>
<tr>
<th>Sex</th>
<th>CDF(s) Present</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>16%</td>
<td>19/116</td>
</tr>
<tr>
<td>Female</td>
<td>5%</td>
<td>6/121</td>
</tr>
<tr>
<td>Indeterminate</td>
<td>1%</td>
<td>1/10</td>
</tr>
<tr>
<td>Total</td>
<td>11%</td>
<td>26/247</td>
</tr>
</tbody>
</table>

*Table 5.18. Cranial depression fractures for each sex.*

The 26 individuals with CDFs were mostly in the old adult (n=20) category for age at death (see Table 5.19). Only four individuals had died as young adults with CDFs and two of indeterminate adult age at death had a single CDF. Because each of these depression fractures was fully healed, it is impossible to know when the injury occurred during most individuals’ lifetimes. It can be said, however, that the four individuals in the young adult category had experienced this trauma early in adulthood. For those in the
old adult category, the injuries could have occurred at any time except immediately preceding death.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>CDF(s) Present</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young Adult</td>
<td>6%</td>
<td>4/64</td>
</tr>
<tr>
<td>Old Adult</td>
<td>14%</td>
<td>20/125</td>
</tr>
<tr>
<td>Adult</td>
<td>3%</td>
<td>2/58</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>11%</strong></td>
<td><strong>26/247</strong></td>
</tr>
</tbody>
</table>

*Table 5.19. Cranial depression fractures for each age group.*

As a whole, the 11% occurrence of cranial depression fractures among Mimbres individuals is higher than might be expected given the lack of archaeological data that is suggestive of warfare. It is important to note the location of depression fractures on the crania in the sample so that patterning can be used to inform the interpretation of violence or accident. Cranial depression fractures among the Mimbres sample were located almost exclusively on the frontal and parietal bones of the cranial vault (see Figure 5.4).
Eleven CDFs each were located on the left parietal and frontal bones, eight CDFs were on the right parietal, and a single CDF was on the occipital. Males and females both experienced cranial trauma to the three major areas affected, thus there is no patterning that differentiates the sexes. Comparison of injury location over time revealed a lack of patterning for either of the sexes.

The distribution of CDFs on the cranium indicates that injuries were likely the result of interpersonal violence. As described earlier, cranial injuries above the hat brim line are more likely to be the result of an attack than an accident. Nearly all of the CDFs

*Figure 5.4. Schematic of CDFs on the cranium, differentiated by sex. Adapted from Wilkinson 1997.*
fall above the hat brim line and the few that do not are within the zone that can still be the result of violence. Thus, the data from this analysis suggest that cranial depression fractures were not typically accidental injuries. Furthermore, the placement of CDFs implies violent confrontations in which the perpetrator and victim were engaged in face to face conflict. Given that most people are right-handed and would wield a weapon in that hand, left parietal and frontal injuries would be expected to be more frequent (as they are here) if those individuals were positioned face to face.

Examination of CDFs by site provides a better understanding of the distribution of these injuries across the region. As can be seen in Table 5.20, CDF injuries were most prevalent at NAN Ranch Ruin and Wind Mountain, although the frequencies were similar at Harris and Mattocks as well. Cranial injuries are observed among males and females at several sites however the differential between sexes at NAN Ranch Ruin and Wind Mountain is interesting. Only males (n=8) at NAN had CDFs, while twice as many females (n=4) had CDFs at Wind Mountain than males (n=2). Possible explanations for this observation are addressed in the following chapter.
Table 5.20. Distribution of CDFs by sex and Mimbres site.

<table>
<thead>
<tr>
<th>Site</th>
<th>Males</th>
<th>Females</th>
<th>Indeterminate</th>
<th>Total %</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cameron Creek</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>9.5%</td>
<td>21</td>
</tr>
<tr>
<td>Galaz</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2.6%</td>
<td>39</td>
</tr>
<tr>
<td>Harris</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>12.5%</td>
<td>24</td>
</tr>
<tr>
<td>Mattocks</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>11.8%</td>
<td>17</td>
</tr>
<tr>
<td>NAN Ranch Ruin</td>
<td>8</td>
<td>0</td>
<td>0</td>
<td>12.1%</td>
<td>66</td>
</tr>
<tr>
<td>Old Town</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>16.7%</td>
<td>6</td>
</tr>
<tr>
<td>Swarts</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>5.3%</td>
<td>19</td>
</tr>
<tr>
<td>Walsh</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>33.3%</td>
<td>3</td>
</tr>
<tr>
<td>Wind Mountain</td>
<td>2</td>
<td>4</td>
<td>1</td>
<td>21.2%</td>
<td>33</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>19</strong></td>
<td><strong>6</strong></td>
<td><strong>1</strong></td>
<td><strong>11.0%</strong></td>
<td><strong>247</strong></td>
</tr>
</tbody>
</table>

The temporal findings for cranial depression fractures at Mimbres communities demonstrate that injuries occurred throughout the region’s cultural chronology (see Table 5.21). The results of trauma analysis suggest that cranial injuries increased during the Pueblo period, however when sample size is considered for each temporal period, the frequency of injuries among Mimbres people is shown to decrease over time. It is unfortunate that nine individuals with CDFs could not be assigned to a temporal period; however a pattern does emerge in the results. Pithouse period CDFs were observed on seven individuals while Pueblo period CDFs were observed on ten individuals. The frequency of CDFs for the Pithouse period is 11.7% (7/60) while that of the Pueblo period is 9.3% (10/107). The difference between time periods was not statistically significant (X²(2)=.655, N=160) (see Figures 5.5 and 5.6). It is likely that the undated individuals from Wind Mountain are dated to the Pithouse period given that the occupation during the Pueblo period was so short. If this is true, the frequency of CDFs
in the Pithouse period would increase to 18.5% (12/65). The location of Wind Mountain in the more western Gila River area of the Mimbres region is potentially a factor in the different rates of CDFs observed among site samples and over time. Removing Wind Mountain individuals from the whole Mimbres sample brings the overall rate of CDFs to 8.9% (19/214) and the Pithouse period frequency to 8.6% (5/58). Cameron Creek and Mattocks had longer occupations during both periods, thus it is less likely that their dating to either period can be accurately assumed. The changes in CDF frequencies associated with such changes in the sample dating cannot be made for these sites.

<table>
<thead>
<tr>
<th>Site</th>
<th>Pithouse</th>
<th>Pueblo</th>
<th>Undated</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cameron Creek</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>21</td>
</tr>
<tr>
<td>Galaz</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>39</td>
</tr>
<tr>
<td>Harris</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>24</td>
</tr>
<tr>
<td>Mattocks</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>17</td>
</tr>
<tr>
<td>NAN Ranch Ruin</td>
<td>2</td>
<td>6</td>
<td>0</td>
<td>66</td>
</tr>
<tr>
<td>Old Town</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>Swarts</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>19</td>
</tr>
<tr>
<td>Walsh</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Wind Mountain</td>
<td>2</td>
<td>0</td>
<td>5</td>
<td>33</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>7/60</strong></td>
<td><strong>10/107</strong></td>
<td><strong>9/80</strong></td>
<td><strong>26/247</strong></td>
</tr>
<tr>
<td></td>
<td>(11.7%)</td>
<td>(9.3%)</td>
<td>(11.3%)</td>
<td>(10.5%)</td>
</tr>
</tbody>
</table>

*Table 5.21.* Distribution of CDFs by time period and Mimbres site.
Cranial depression fractures were most frequently small and round in shape; however size and depth of the CDF do not correlate to how significant the blow to the head may have been for the victim. Mean dimensions of CDFs were not substantially different for bone afflicted or for sex of the individual although there were six female
CDFs (three for the frontal and three for parietals). Mean depth of CDFs was similar for both sexes and afflicted bones as well (see Table 5.22). Depths rarely exceeded 1.5 mm, thus indicating they were generally shallow; however, the lack of depth cannot be equated with lack of severity for the injury. All CDFs were healed and categorized as nonlethal but soft tissue damage could also have been significant. Although individuals who had CDFs may have had residual effects (e.g. balance or temperament problems) from their trauma, none exhibited difficulties (e.g. infection) in the healing process of cranial bone.

<table>
<thead>
<tr>
<th>Bone</th>
<th>Males</th>
<th>Females</th>
<th>Indeterminate Sex</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>s.d. n</td>
<td>Mean s.d. n</td>
<td>Mean</td>
</tr>
<tr>
<td>Frontal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td>5.72</td>
<td>3.84</td>
<td>6.99 3.85</td>
<td>N/A</td>
</tr>
<tr>
<td>Width</td>
<td>10.59</td>
<td>4.61</td>
<td>9.97 4.26</td>
<td>N/A</td>
</tr>
<tr>
<td>Depth</td>
<td>0.81</td>
<td>1.08</td>
<td>1.22 0.96</td>
<td>N/A</td>
</tr>
<tr>
<td>Parietal</td>
<td>8.87</td>
<td>4.07</td>
<td>12.27 4.03</td>
<td>21.94</td>
</tr>
<tr>
<td></td>
<td>7.93</td>
<td>1.52</td>
<td>13.44 4.36</td>
<td>11.50</td>
</tr>
<tr>
<td>Occipital</td>
<td>8.34</td>
<td>N/A</td>
<td>1.07 0.95</td>
<td>1.84</td>
</tr>
<tr>
<td></td>
<td>0.59</td>
<td>N/A</td>
<td>N/A N/A</td>
<td>0.59</td>
</tr>
</tbody>
</table>

Table 5.22. Mean dimensions (in millimeters) of CDFs for each sex and the entire subsample.

Perimortem Cranial Trauma

A single perimortem injury (lethal blow to the head) was observed in the Mimbres burial sample. No crania in the sample exhibited trauma such as cut marks (which might
be associated with scalping or decapitation) or projectile trauma. The case of perimortem trauma was in the form of a radiating linear fracture. A 35-50 year old male from Swarts (Burial 366) likely incurred the injury from a blunt force strike to the right eyebrow area. A linear fracture radiated 64 mm toward the frontal boss area of the right portion of the forehead. The fracture exhibited slight healing suggesting that he lived for a short time after the injury, but that the severity of it likely contributed to his death. He did not exhibit any healed CDFs, other injuries, or pathologies. Mortuary data were not plentiful and did not indicate anything unique about this individual. Regardless, the injury and subsequent death would not likely have been caused by anything except violent action.

**Post-Cranial Trauma**

Post-cranial trauma was observed on five females and two males (see Table 5.23). These injuries included long bone fractures (commonly associated with falling) but their origin from accident or violence cannot be determined. Fractured bones included radius, ulna, humerus, femur, and fibula. Fractures were mostly slight to moderate but one older female (Galaz 15-3) had a severe break to her left humerus which had not been reset and had not completely healed. The injury would likely have resulted in a significant loss of mobility for the left arm. All individuals impacted by long bone fractures did not have cranial depression fractures or other pathologies.
Table 5.2. Individuals with post-cranial fractures.

<table>
<thead>
<tr>
<th>Site</th>
<th>Burial</th>
<th>Temporal Assignment</th>
<th>Sex</th>
<th>Age</th>
<th>Bone</th>
<th>Description of Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Galaz</td>
<td>15-3</td>
<td>Pueblo</td>
<td>Female</td>
<td>Old Adult</td>
<td>Humerus (L)</td>
<td>Severe midshaft fracture. Not reset prior to healing. Healed.</td>
</tr>
<tr>
<td>Galaz</td>
<td>20-6-20</td>
<td>Late Pithouse</td>
<td>Female</td>
<td>Indeterminate</td>
<td>Radius (L) &amp; Ulna (L)</td>
<td>Moderate distal shaft fractures. Healed.</td>
</tr>
<tr>
<td>Wheaton-Smith</td>
<td>42-2-3B</td>
<td>Late Pithouse</td>
<td>Female</td>
<td>Indeterminate</td>
<td>Fibula (R)</td>
<td>Slight proximal shaft fracture. Healed.</td>
</tr>
<tr>
<td>Harris</td>
<td>57 N1290</td>
<td>Late Pithouse</td>
<td>Male</td>
<td>Middle Adult</td>
<td>Ulna (R)</td>
<td>Moderate midshaft fracture. Partially reset prior to healing.</td>
</tr>
<tr>
<td>NAN Ranch Ruin</td>
<td>140</td>
<td>Pueblo</td>
<td>Female</td>
<td>Old Adult</td>
<td>Femur (L)</td>
<td>Moderate femoral head fracture. Healed.</td>
</tr>
<tr>
<td>NAN Ranch Ruin</td>
<td>179</td>
<td>Pueblo</td>
<td>Female</td>
<td>Young Adult</td>
<td>Radius (L &amp; R) &amp; Ulna (L &amp; R)</td>
<td>Slight distal shaft fractures including epiphyses. Healed.</td>
</tr>
</tbody>
</table>

Summary

The analysis of the human remains from 247 adults from the Mimbres region revealed a relatively normal demographic distribution of males and females and good representation across the age categories (young and old adult). Health and nutritional adequacy at Mimbres appears to have been good with no dietary deficiencies. All groups by archaeological site and demographic categories demonstrated slight to moderate levels of robusticity and none of the groups appeared to have engaged in heavier physical burdens in their activities. Sexual dimorphism based on stature is normal for prehistoric agriculturalists, and there are no data to support sexual division of labor.

Trauma analysis demonstrated nonlethal cranial depression fractures for 26 individuals (19 males, 6 females, 1 indeterminate sex) and one perimortem radiating fracture on a middle aged male from Swarts. This likely indicates evidence for a violent
confrontation in a face to face position rather than accidental injury. Rates of cranial injuries decreased slightly (2.4%) over time but more accurate dating could indicate a greater decrease from the Pithouse into the Pueblo time period. A few individuals with post-cranial fractures of the long bones suggest that either accidental or violence-related falls. These results are discussed in the following chapter.
CHAPTER 6
DISCUSSION

This research brings together biological data from Mimbres skeletal remains and cultural data from archaeological contexts to explore community social interaction throughout the Mimbres cultural sequence. Through an assessment of health, activity, and involvement in violent conflict as well as observations of mortuary data, this research is better able to provide insights into Mimbres social structure and group and personal behavior. Questions regarding the use and role of violence are addressed and comparison of Mimbres communities within the greater American Southwest is made.

Biocultural Identity and Social Organization

Findings of this bioarchaeological analysis reveal a consistent regional social system for Mimbres communities. Demographic data for the 247 adults do not suggest vast differences for the 18 communities as a whole or individually. Sex and age groups were even in representation for nearly all sites in the sample. Higher morbidity and mortality are not indicated for any subgroups in the sample. The uniformity of the burial sample suggests that people were more alike than they were different both within and between communities. Such observations point toward a common group identity and a lack of significant differentiation within Mimbres social organization. This has previously been discussed by Gilman (2006) and Hegmon (1989) primarily using archaeological data. The following section presents specific biological data to
demonstrate adaptability and the degree to which stress impacted whole or parts of Mimbres communities.

Environmental Adaptation for Mimbres Communities

As an indicator of nutritional adequacy, stature data from the sample revealed sufficient diets among the sample. The results of the stature analysis indicate no major differences in access to resources both within and between Mimbres communities. Considering stature over the course of Mimbres chronology, males experienced a slight decrease while females experienced a slight increase during the later Pueblo period. The change in mean stature was -1.31 cm for males and 0.38cm for females. The change over time for males is therefore most likely due to population level processes (e.g., genetic variability).

Reliance on maize increased into the Late Pithouse and early Pueblo period (Diehl 1996, 2005). Population expansion and community growth were accompanied by agricultural development and over-exploitation of large game (Cannon 2000). This depleted the environment at a greater rate during the Pueblo period peak of Mimbres cultural development (Minnis 1985). Protein from large game (for example, deer) was replaced by other resources such as rabbits that were not able to provide the same nutritional value (Cannon 2000). Stature may have been impacted by these changes in subsistence strategies. As resource stress increased, the cultural adaptive response was to expand away from the core population areas such as the Mimbres River Valley (Minnis 1985). The biological response does not appear to have been drastic, but a more plentiful
and variable diet available in earlier occupations may have resulted in greater average stature than what is observed among later occupations.

Mean stature for Mimbres males decreased (162.89cm to 161.58cm) over time while that of females increased (152.81cm to 153.19cm). A decrease in protein from large game may have been more substantial for male diets than for female diets since males would have been most involved in securing those resources and potentially had greater access to them during the Pithouse period. For females, protein intake may not have changed over time as protein sources changed and that could explain why they experienced an increase in mean stature over time rather than a decrease.

The mean statures for Pueblo period Mimbres males and females are compared to those of other prehistoric Mogollon populations in Table 6.1. The Mogollon sites were aggregated and occupied later (approximately 200-450 years) than the Mimbres sample but represent the best comparable samples for the region due to shared cultural patterns, environments, and subsistence strategies. Mean stature of Mimbres males (Pueblo period subsample) was found to be less than reported data for other Mogollon skeletal samples however this difference was not found to be statistically significant (p=.406, Kruskal-Wallis test). Mean stature of Mimbres females (Pueblo period subsample) was greater than other Mogollon samples but, again, this difference was not found to be statistically significant (p=.406, Kruskal-Wallis test). Although the shortest overall, Pueblo period Mimbres males are comparable to other Mogollon sites, as the mean statures fall within 1 centimeter of each other. The variation in female mean statures is much greater and spans a range of over 5 centimeters.
Table 6.1. Comparison of mean statures among prehistoric Mogollon sites.

<table>
<thead>
<tr>
<th>Site</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carter Ranch</td>
<td>162.20cm</td>
<td>147.70cm</td>
</tr>
<tr>
<td>Grasshopper Pueblo</td>
<td>162.57cm</td>
<td>151.56cm</td>
</tr>
<tr>
<td>Ma'ip'ovi (Kinshipba)</td>
<td>162.30cm</td>
<td>151.16cm</td>
</tr>
<tr>
<td><strong>Mimbres</strong></td>
<td><strong>161.58cm</strong></td>
<td><strong>153.19cm</strong></td>
</tr>
<tr>
<td>Point of Pines</td>
<td>161.94cm</td>
<td>150.06cm</td>
</tr>
</tbody>
</table>

The fact that Mimbres populations are comparable to other regional skeletal samples indicates that they were capable of thriving in their environment with their available resources. Neither sex appears to have struggled nutritionally. Actually, other populations in the region had larger disparities between males and females than that observed in this Mimbres subsample. Mimbres males and females differed by 8.39 cm while the other Mogollon sites had sex differentials of 11 to 14.5 cm. The difference between males and females within Mimbres sites is greatest at Wind Mountain (by 13 cm where males are the very tallest in the whole Mimbres sample) and Harris (by 11 cm). Only these two sites compare to the larger differences at these later Mogollon sites. The smaller differential between Mimbres Pueblo and Mogollon samples suggests that Mimbres populations were perhaps better at maintaining equal resource access between the sexes and achieving maximum stature potential. It also supports a model of social organization in which the sexes were not substantially differentiated in hierarchies within
communities. This may also explain the variation in mean stature of select Mimbres communities as well.

**Physicality through the Mimbres Cultural Sequence**

Assessment of Mimbres physicality does not reveal disparities within or between communities. Only a few findings demonstrated differences in physical development for subgroups of the sample; however they were not statistically significant. These include mean scores for entheseal development of extremities (upper and lower) and mean robusticity indices for the humerus and femur.

First, comparison of physicality among both age groups and sexes revealed differences in lower extremity entheseal development for females at different Mimbres sites. Young females at Galaz and Wind Mountain had higher mean scores compared to older females at Harris and NAN Ranch Ruin (see Table 5.9). This difference in scores indicates potentially altered activity patterns related to female labor given that the older sample would be expected to have greater entheseal development and thus higher mean scores.

Although sample sizes are lower once temporal assignment is accounted for, comparison of mean scores of entheses is still meaningful to gauge change in physicality over time. During both the Pithouse and Pueblo periods, young adult mean scores for both sexes were consistently lower than those of older adults. Comparing each age group and sex over time, however, shows that young adult males did not have as robustly developed enthuses during the Pueblo period. This was not the case for young adult females, who became more physically developed in the later cultural sequence. Older
females did decrease lower extremity physicality in the Pueblo period however. These changes are perhaps suggestive of a shift in the division of labor for some individuals or less effort needed later in the cultural sequence as population increased and/or labor changed. The degree of change for female upper extremities is minimal, however, so perhaps little changed for activities involving the upper body.

Activities related to increased agricultural production and decreased hunting and gathering could potentially explain the changes for both upper and lower extremity physicality for the two sexes. Agricultural intensification into the Pueblo period would have involved greater physical development of female upper extremities (and potentially lower extremities) due to more frequent grinding actions for maize processing. For young males, the increase in agricultural production would have possibly reduced physical development of both upper and lower extremities as they were more involved in field maintenance and harvests and less involved in hunting (and associated mobility) activities. This is consistent with findings by Ogilvie (2005) and Ruff and Larsen (1990). Older males increased physical development throughout the cultural sequence and this could be related to disproportional participation in other community functions such as the building of structures which is more typically a male activity (Baustian and Martin 2010).

Next, robusticity indices for humeri and femora are similar within sex groups and across communities, suggesting consistency in physical activity. Over time, however, humeral robusticity increased for both males and females while femoral robusticity decreased for males and increased for females. Sample size is potentially a major factor for these results as only whole bones could be included in this analysis and preservation
was a limiting factor. The change in humeral robusticity over time was greater than that of femoral robusticity. These differences between the Pithouse and Pueblo periods may reflect changing movement patterns of the upper extremities as they relate to increased maize agriculture (for both males and females) and decreased hunting (for males). Female femoral robusticity only increased slightly over time and male femoral robusticity did decrease but, again, very small sample size for the Pithouse period is a factor that cannot be ignored as potentially meaningful. Overall, the results indicate that a sexual division of labor did exist but that changes in physical development were greater for males and this likely indicates more significant shifts in labor efforts over time.

While males and females were engaged in different activities, the analysis demonstrates that both maintained physical development at similar levels (with males generally being somewhat more developed). The fact that males and females were not substantially different is suggestive that, regardless of specific labor tasks, they were more similar to one another than different. Some differences in physicality might be explained by social roles in communities; however this is not corroborated by contextual data such as mortuary goods that could indicate specific functions of individuals. Social stratification is not indicated by these results either. All adults appear to have been engaged in at least moderate labor efforts.

The Use of Violence in Mimbres Society

Results of trauma analysis suggest that violence in Mimbres society was used sparingly and likely was not imbued with fatal intent. Possible lethal violence was only
observed on a single individual while all other occurrences of conflict were deemed nonlethal. For the male with the perimortem injury (Swarts Burial 366), the blow would have come during face to face conflict. He did not exhibit other injuries, healed or otherwise, or any other skeletal defects such as disease processes.

Nonlethal violence, in the form of cranial depression fractures, demonstrates that some violence was present and contradicts much of what has been theorized for the Mimbres region (i.e., one void of conflict) (see for example Hegmon, et al. 2008; LeBlanc 1999). Archaeological excavations have not revealed traditional indicators of warfare or raiding for Mimbres sites and the results of this research corroborate a lack of these forms of violence. The cranial injuries do, however, provide evidence of direct violence. Indirect and performative violence are not well-supported by additional skeletal or contextual data, however they cannot be ruled out either.

Interpersonal conflict is the most likely source of the nonlethal cranial depression fractures observed in the Mimbres sample. The distribution of CDFs over the different areas of the skull is consistent with Walker’s (1989) observations among the Chumash of southern California. His study determined the placement of cranial vault injuries to be different from warfare and raiding case studies in which injuries were more prevalent on the back and right side of the cranium. His conclusions indicated interpersonal conflict among the Chumash as well after the injuries were found to be similar to patterns of conflict injuries observed in modern forensic contexts. The reasons for the Chumash engaging in such conflict are not well understood but Lambert (1997) suggests that
conflict may have escalated as population growth and stress associated with changing social organization increased.

Nonlethal trauma, in the form of cranial depression fractures (CDFs), was observed at a rate of 10.5% for the Mimbres sample in this study. This rate is slightly surprising due to the lack of archaeological evidence of warfare yet it is not so high as to be contradictory to current interpretation. The healed, nonlethal CDFs documented in this study are not indicative of warfare. Instead, these injuries suggest small scale conflict between individuals rather than large groups. Furthermore, the intent of the perpetrators would appear to be to maim but not kill since only one perimortem cranial injury was observed in the sample of 247 individuals. The physicality results, health data, and mortuary features of each community in the sample do not indicate social stratification, so violence was likely a common behavioral strategy for mitigating interpersonal conflict. For injury rates to be kept lower than those in the later (after AD 1275) prehistoric period in areas closer to the Four Corners region, the Mimbres people may have had other factors that kept conflict from occurring. One such factor may have been social organization.

Violence as a Mechanism of Social Order

Bioarchaeological research among ancient North American populations, where warfare is not indicated, generally finds rates of 2%-5% for cranial depression fractures and other injuries, although this can vary slightly (Jurmain 1999). The frequency of 9-11% among the Mimbres sample (depending on whether or not the Wind Mountain subsample is included) thus warrants reconsideration of the role of conflict, whether that
be with outsiders or within the cultural community. Because there are little to no data to indicate warfare, the violence taking place within Mimbres communities must have an alternate explanation. Violence or perhaps merely the threat of violence, what Schroder and Schmidt (2001) describe as the \textit{violent imaginary}, may have been utilized as a mechanism of maintaining social order as the Mimbres population grew. Community and regional growth along with intensification of agriculture would have been accompanied by an increased demand for land management. This could have led to conflict between those who had long-established land tenure and those who did not.

Several Mimbres researchers have suggested extended family corporate groups based on founding lineages in communities and they posit that these groups (or select persons within the groups) maintained access to local agricultural lands (Creel 2006a; Roth and Baustian In Press; Roth, et al. 2012; Shafer 2006). Anyone seeking to challenge those in control of land might do so in ways that escalated to interpersonal conflict and nonlethal injury.

Alternatively, nonlethal violence (or threat of violence) at Mimbres sites may have been implemented by those in select social roles to deter such challenges to the active social system. In this instance, the aggressor and victim (or intended victim) are part of violence as a performance in which a message is communicated to both the victim and the local community (witnesses) who would observe the act and/or effects of violent conflict (Schulting and Wysocki 2005). The rates of nonlethal violence observed in this study could therefore be lower than what actually took place since soft tissue injuries would not be represented by the skeletal sample.
Temporal Shifts in the Use of Violence

Violent confrontations that led to cranial injuries decreased slightly as the Mimbres entered the Pueblo period. If the undated Wind Mountain burials could be associated with Pithouse period, however, the difference between the cultural periods would drop substantially more than 2.4%. Alternatively, excluding the Wind Mountain sample demonstrates a drop in CDFs by 2.8% between the Pithouse and Pueblo periods. Although the observed rate of cranial depression fractures did not decrease by a large amount over time, the factors contributing to that lower rate can still be theorized. Given that population pressures and resource depletion increased as stressors during the Mimbres Pueblo period, it would not be unreasonable to expect at least similar or even increased rates of violently induced trauma as a behavioral response to those stressors. Since the data from this study document the opposite, other social factors should be considered as having a role in mitigating violent strategies. For example, the decrease from the Pithouse into the Pueblo period could be associated with corporate group social organization. Kohler and colleagues (2014) present fluctuations in rates of violent trauma in the Northern Rio Grande and Central Mesa Verde regions as potentially associated with variability in maize harvests and better functioning social structures. Mimbres corporate groups, or select individuals (such as elders) in those groups, may have held influence over others (Creel 2006a). These individuals may have impacted the behaviors of others and pressured them to be nonviolent during conflict situations. Archaeological data are not indicative of intercommunity raiding or warfare, therefore most violent encounters were likely within single communities. The lower incidence of
violence observed in the Mimbres Pueblo period could reflect corporate groups as a successful strategy for maintaining social order when stress increased.

In addition to the positive influence of corporate group social organization, ritual activities in place throughout the Pithouse period, and into the Pueblo period, may have also contributed to community cohesion. The Great Kivas in use throughout the Pithouse period of Mimbres society were places for some community members to come together and participate in the same ritual events (Creel and Anyon 2003a, b). The elaborate and symbolic retirement of these structures indicates significant meaning to the communities that used them (Creel and Anyon 2003a, b, 2010). During the Classic Pueblo period, ritual activities were carried out in plazas of communities (Creel and Anyon 2003a). This more public setting would have been more inclusive of the whole community and could have resulted in stronger bonds between people involved. Furthermore, increased group participation in ritual ceremonies and community efforts (such as irrigation construction) would have promoted stability and decreased tensions (Powell-Marti and James 2006; Shafer 2006). With a more developed cohesion, conflict between individuals may not have escalated to violence or injury and that is partially responsible for the decrease in cranial trauma during the Pueblo period, even when stress may have been heightened.

As the Mimbres people entered the 2nd millennium AD, their interactions with outsiders diminished (Minnis 1985) and this could also have been a factor in the decreased rates of violence. If Pithouse period injuries were sometimes the result of conflict between Mimbres people and outsiders, the reduced contact in the Pueblo period may have also prevented violence. It is possible that observations of the more stratified
and complex Hohokam and Anasazi societies outside of their region were perceived as a threat to their goals as a culture group. Particularly if violence was observed in those outside areas, the Mimbres people may have intentionally avoided outsiders to preserve their identity (Potts, et al. 2013).

**Geographic Factors in the Use of Violence**

The rate of cranial injuries among the burials at Wind Mountain is higher than most sites represented in the sample. The geographic location of this site must be considered as a factor in this rate as it is the only Gila River sample available for inclusion in this study. As a community on the western periphery of the Mimbres culture area, the people of Wind Mountain would have had more opportunities to encounter outsiders. Communities within the core Mimbres River Valley, in contrast, were more likely to have encounters only with other Mimbres people. Higher trauma rates may thus have resulted from unfriendly relations with non-Mimbres people. Furthermore, the higher incidence of CDF injuries among females in this peripheral community poses the possibility of raiding attacks for women. No archaeological findings have demonstrated attacks on the community, but they cannot be completely ruled out either.

**Mortuary Patterns as Indicators of Mimbres Social Roles**

Within corporate social groups at Mimbres communities, specific individuals could have maintained slightly elevated power positions. To date, archaeological data have not lent support for such positions. Mortuary patterns observed in this study do not demonstrate stark differences for social status in Mimbres society. Both males and
females and adults of all ages were buried with similar numbers and types of grave goods. These findings corroborate those of Gilman (1990) in that grave goods were not observed in patterns that revealed social hierarchy.

A new observation in this study does suggest that differential social power may have existed in Mimbres communities, however. While excavating Late Pithouse period burials at the Harris site between 2011 and 2013 and analyzing burial records of those excavated by Haury in 1934, several individuals were found to have been buried in upright, seated positions which deviates from the typical horizontal flex or semi-flexed position. The circumstances of these burial features, the bodies themselves, and the similarities in types of grave goods indicate that these men and women were buried in this position because of their social standing or role in the community. Interpretation of the specific roles held by these people is ongoing but initial thoughts are that seated females could have familial rights to land tenure (Roth and Baustian In Press; Roth, et al. 2012) and seated males could have ritual roles such as community shamans (see, for example Shafer, et al. 1989).

Horizontal stratification in social organization of communities is not wholly absent in Mimbres research. Scholars have suggested that differential social roles were likely yet the archaeological record has not yet demonstrated concrete evidence of such (Creel 2006a; Diehl 2006). Creel and Anyon (2003a) have discussed the likelihood that Burial 18 (and probably Burial 19) at the Old Town site is one such individual with special significance to the community. Based on the context of this adult male burial within a communal pit structure, the authors infer the intentionality of the placement of
his body to reflect his potential importance to ritual practice or other leadership roles.

What the current project and the ongoing inquiry into seated burials may go on to show is that Mimbres communities were inclusive of numerous social positions with various forms of power and influence over others. This is not to say that vertical stratification was present. Rather, select individuals or families in a community may have been recognized as different from the general population.

**Summary**

Biological data from Mimbres burials reveal information about social interactions as well as responses to their environment and other stressors. Compared to other prehistoric communities in the American Southwest, stature data show that the Mimbres people were reasonably well adapted to their environment. They were also similar to some populations in the use of violence. For Mimbres communities, violence is not indicated as a common behavioral strategy yet rates of nonlethal trauma suggest that it played a role in occasional daily encounters. The observation that these rates are not nearly as high as other ancient communities suggests that social factors may have assisted in preventing violent responses both within and between communities. Corporate social structures working in Mimbres society could have served to keep peace.
CHAPTER 7
CONCLUSIONS

Archaeologists have revealed extensive amounts of data about prehistoric Mimbres culture in the past century yet their interpretations have largely omitted biological data from human burial analysis. This project has sought to remedy this problem and to provide a more comprehensive biocultural approach to specific questions asked about Mimbres society. As a bioarchaeological project, it also serves to shed light on the kinds of data that are available in this particular field of archaeological research.

This research has had two major objectives:

1. Understand Mimbres social interactions (interpersonal, intragroup, and intergroup) from a bioarchaeological perspective.

2. Document biological indicators of violence taking place in the Mimbres region and contextualize them through a biocultural approach.

These objectives address topics that have not been adequately addressed in the literature or have been presented with incomplete data. For example, many scholars discuss Mimbres burials in their research but only report on mortuary patterns and not biological data (Creel 1989; Gilman 1990; Shafer 1995). Alternatively, others present interpretations of the collective Mimbres society that incorporate biological data from only a limited number of Mimbres skeletons (Hegmon, et al. 2008; Holliday 1993). For example, in their discussion of resilience and rigidity in the Mimbres area, Hegmon and colleagues (2008) report little physical suffering (i.e., disease or violence) citing a single
Master’s thesis (Lippmeier 1990) that only included human remains from the Maxwell Museum. The sites represented by that collection include Bradsby, Carr Lake, Disert, Galaz, Mattocks, Mitchell, Montoya, Walsh, and Wheaton-Smith. It is problematic that this thesis is so commonly cited because the human remains represent only those sites excavated by the Mimbres Foundation and mostly date to the Classic period and later. Thus, the statements made by researchers up to this point have not been representative of all Mimbres areas or time periods. The data presented in this project therefore have great potential to push new thinking and interpretation of prehistoric Mimbres communities among scholars both novice and expert.

**Contributions of Research**

This bioarchaeological study accomplishes its goal of investigating Mimbres social organization. The results include biological and contextual data from Mimbres human burials and provide substantial information to contribute to archaeological reconstructions. The biological data support current archaeological interpretation of a social system that lacked vertical hierarchies. Both the biological and mortuary data also failed to produce any findings to suggest leaders. As described previously in the discussion chapter, however, the mortuary findings suggest potential social significance for some individuals in communities. Overall, there are not indicators of stratified society.

This research also establishes that, contrary to the general consensus in Mimbres research, violence did have a role in Mimbres society. Its implementation does not
appear to be linked to warfare or large scale conflict, however. In this way, the results corroborate what the archaeological record has indicated. Archaeologists claiming that the Mimbres did not engage in warfare can now do so with a more complete dataset as the information from human remains does not support that kind of activity. The rates of healed cranial injury support low-level interpersonal violence generally for the region. The injury data from burials at Wind Mountain, however, prompt further consideration of events and interactions at other Gila River and peripheral sites in the future because they do differ from data generated from Mimbres Valley sites.

**Implications of Research**

This research opens the door to more questions about the Mimbres people and can potentially complement previous studies by contributing additional lines of evidence for various areas of inquiry. With the use of this dataset, interpretation of Mimbres adaptation can now utilize region-wide biological data that span the cultural chronology.

Additionally, the research here presents a case study for investigating violence and considering it as a tool for maintaining social order. The data from the Mimbres skeletal sample provide an opportunity to contemplate nonlethal action and/or the threat of violent action as ways in which communities avoid chaos and social disruption. Though it cannot be confirmed as a behavioral strategy in this study, the data can be considered in an alternative way that exemplifies how more subtle forms of violence can potentially be just as effective in daily and long-term interactions both within and between groups. As violence research is expanded within anthropology and other social
sciences, additional studies like this can bolster the understanding of violence as an expression of power and influence, even when acts of physical harm are not actually committed.

This bioarchaeological project demonstrates the utility of a biocultural approach to further allow more nuanced interpretation of the social aspects of the Mimbres people. The cultural changes observed through the Pithouse to Pueblo transition, particularly the change to more public ritual practices and an inward-focused identity, can further enhance the interpretation of the biological data related to conflict. Within the greater context of cultural shifts that took place during the Pithouse and Pueblo temporal spans, the decreased rate of cranial trauma in the latter period can be considered an effect of better social cohesion and Mimbres community interaction.

Finally, this study provides an opportunity for Mimbres archaeology to be elevated to a higher level of recognition within ancient American Southwest research. The results demonstrate that the Mimbres were more similar to other Southwest populations than previously recognized. Often less emphasized due to their lack of complex architecture, the Mimbres should be included more frequently in broad discussions of Southwest cultural history alongside the Anasazi (Ancestral Pueblo) and Hohokam groups. If not included in all topical discussions, the commentary on violence should be more inclusive of the Mimbres than it has in the past. LeBlanc (1999) essentially omits the Mimbres from his Southwest violence chronology due to a lack of archaeological data to support his arguments. In a way, he uses the lack of evidence of violence to conclude that it did not take place. This research establishes that violence
was present in many forms in the prehistoric American Southwest and corroborates other studies that have shown that violence can be enacted through more than just warfare scenarios (Baustian 2014; Baustian, et al. 2012; Harrod 2012a, 2013; Martin, et al. 2008; Martin, et al. 2010).

**Future Directions**

Bioarchaeologists investigating violence are expanding the understanding of how it plays many roles in a myriad of social settings. For research in the ancient American Southwest, so much of the literature has focused only on lethal conflict. This research on Mimbres groups represents just one of several recent and ongoing projects that concentrate on nonlethal violence. Studies like this provide a more nuanced interpretation and understanding of what social interactions might be taking place within populations that might appear “archaeologically peaceful”.

More bioarchaeological analysis is needed in Mimbres archaeological studies. Curated skeletal collections currently exist but their repositories are located all across the United States. Accessing them all is expensive and problematic for most projects but it is necessary to generate comprehensive data and conclusions. Future work that addresses additional questions pertaining to population variation within the region and greater social issues of the Mimbres people would be beneficial. To do this, Mimbres skeletal data need to be compared to that of other populations whose human remains have been studied. Lastly, additional comparison to violence data elsewhere in the American
Southwest will continue to build upon reconstructions of the cultural and biological effects of change.
## CRANIAL DATA SHEET

### Site Name
______

### Burial #
______

### Project ID
______________

### Recorder
______________

### Date
______________

### Collection
______________

### Associated Post-Crania
Y  N

### Age


<table>
<thead>
<tr>
<th>Open (0)</th>
<th>Minimal Closure (1)</th>
<th>Significant Closure (2)</th>
<th>Completely Obliterated (3)</th>
<th>Unobservable (9)</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Midlambdoid</td>
<td>2. Lambda</td>
<td>3. Obelion</td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>Lambdoid</td>
<td>17. Coronal</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Vault (1-7)
______

M U Lateral-anterior (6-10) ________ M U

### Complete Skull (1-17) ________

M U

### Comments:

### Sex

Buikstra and Ubelaker (1994)

<table>
<thead>
<tr>
<th>Female (1)</th>
<th>Probable Female (2)</th>
<th>Indeterminate (3)</th>
<th>Probable Male (4)</th>
<th>Male (5)</th>
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<tbody>
<tr>
<td>Nuchal Crest</td>
<td>________</td>
<td>M U</td>
<td>Mastoid Process</td>
<td>________</td>
</tr>
<tr>
<td>Supra-Orbital Margin</td>
<td>________</td>
<td>M U</td>
<td>Supra-Orbital Ridge</td>
<td>________</td>
</tr>
<tr>
<td>Mental Eminence</td>
<td>________</td>
<td>M U</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Dental

Goodman and Rose (1991)

| TOTAL # LEHs present | ________ |
| Tooth # ________ | Distance from CEJ | Total Crown Height | ________ |
| Tooth # ________ | Distance from CEJ | Total Crown Height | ________ |
| Tooth # ________ | Distance from CEJ | Total Crown Height | ________ |
| Tooth # ________ | Distance from CEJ | Total Crown Height | ________ |
| Tooth # ________ | Distance from CEJ | Total Crown Height | ________ |

(Attach additional sheet if necessary for additional LEHs)
### CRANIAL DATA SHEET

**Trauma**

**Cranial Depressions**

<table>
<thead>
<tr>
<th>Depth</th>
<th>Location</th>
<th>Size (mm)</th>
<th>Type</th>
<th>Antemortem</th>
<th>Perimortem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shallow</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deep</td>
<td></td>
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<table>
<thead>
<tr>
<th>Depth</th>
<th>Location</th>
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<th>Type</th>
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135
## CRANIAL DATA SHEET

### Pathology

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### POST CRANIAL DATA SHEET

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<th>Associated Crania</th>
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#### Age

Todd (1920) / Brooks and Suchey (1990) / Lovejoy et al. (1985)

<table>
<thead>
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<th>IV</th>
<th>V</th>
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**Pubic Symphysis**

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<th>M (28.7) R (21-46)</th>
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<th>M (35.2) R (23-57)</th>
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<th>M (61.2) R (34-86)</th>
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#### Stature

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| Head diameter | |
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#### Robusticity index

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<th>Femur</th>
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<td>U</td>
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<thead>
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<th>Max length</th>
<th>A-P diam</th>
<th>M-L diam</th>
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### Comments:

- Associated Crania
- Age
- Pubic Symphysis
- Sex
- Ventrer Arch
- Ischiopubic Ramus
- Sciatic Notch
- Stature
- Robusticity index
- Comments:
## POST CRANIAL DATA SHEET

### Entheses
**Marioiti et al. (2007)**

<table>
<thead>
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<th>High</th>
<th>Very High</th>
<th>Unobservable</th>
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<td>(9)</td>
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- **Humerus**
  - Pectoralis major ______
  - Deltoideus ______
  - Brachioradialis ______
- **Radius**
  - Biceps brachii ______
- **Ulna**
  - Triceps brachii ______
  - Brachialis ______
- **Femur**
  - Gluteus maximus ______
  - Iliopsoas ______
- **Tibia**
  - Quadriceps tendon ______

**Comments:**

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### Musculoskeletal Stress Markers
**Capasso et al. (1999)**

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- **Femur**
  - Poirier’s facet ______
  - Peritrochlear groove ______
  - Posterior cervical imprint ______
- **Tibia**
  - Squatting facet ______
- **Sacroiliac**
  - Accessory facets ______

**Comments:**

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Severity | Stage of Healing

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Severity | Stage of Healing

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- **Stage of Healing**

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<td>Moderate</td>
<td>Severe</td>
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</table>

- **Severity**
- **Stage of Healing**

**Comments:**

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<th>Location</th>
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- **Severity**
- **Stage of Healing**

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- **Severity**
- **Stage of Healing**

**Comments:**
APPENDIX B
DATA COLLECTION MANUAL

FIELD MANUAL

NON-LETHAL VIOLENCE AND MUSCULOSKELETAL STRESS

Department of Anthropology
University of Nevada, Las Vegas
**CRANIAL**

**Age**

Buikstra and Ubelaker (1994) / Meindl and Lovejoy (1985)

Buikstra and Ubelaker (1994) / Meindl and Lovejoy (1985)

Figure 19.4 Cranial suture fusion sites, after P. Walker, in Buikstra and Ubelaker, (1994) (sites left, descriptions opposite, scores below). A score of 0 (unfused) to 3 (completely obliterated) is assigned to each site. Sites are 1-centimeter endocranial segments of the sutures as shown. Endocranial segments are slightly larger in the Meindl and Lovejoy (1985) system. Scores are independently summed for vault (Nos 1–7) and lateral-anterior (Nos 5–10) sites. Other suture sites, such as the maxillary suture (Mann et al., 1991), have been used to segregate individuals into even broader age categories, but their use in forensic cases has been questioned (e.g., Gruspiel and Mullen, 1991).


<table>
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<th>Standard Deviation</th>
</tr>
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<tr>
<td>7–11</td>
<td>39.4</td>
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<tr>
<td>12–15</td>
<td>45.2</td>
<td>12.6</td>
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<td>16–18</td>
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<td>12.6</td>
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<td>56.2</td>
<td>8.5</td>
</tr>
<tr>
<td>15</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>
Sex
Buikstra and Ubelaker (1994)

**Cranial**

Buikstra and Ubelaker (1994). In scoring the features, optimal results are obtained by holding the cranium or mandible at arms length, a few inches above the appropriate portion of this figure, oriented so that the features can be directly compared with those illustrated. Move the bone from diagram to diagram until the closest match is obtained. Score each trait independently, ignoring other features. A specific procedure for each trait is described below, with the extremes described and the intermediates illustrated in the figure.

**Nuchal Crest:** View the lateral profile of the occipital and compare it with the diagram. Feel the surface of the occipital with your hand and note any surface irregularity, ignoring the contour of the underlying bone. Focus on the majority attendant to attachment of nuchal musculature. In the case of minimal expression (score = 1), the external surface of the occipital is smooth with no bony projections visible when the lateral profile is viewed. Minimal expression (score = 5) denotes a massive nuchal crest that projects a considerable distance from the bone and forms a well-defined bony ledge or “hook.”

**Mastoid Process:** Score this feature by comparing its size with that of surrounding structures such as the external auditory meatus and the pyramidal process of the temporal bone. Mastoid processes vary considerably in their proportions. The most important variable to consider in scoring this trait is the width of the mastoid process, not its length. Minimal expression (score = 1) is a very small mastoid process that is only a small distance below the inferior margin of the external auditory meatus and the jugular groove. A massive mastoid process with length and width several times that of the external auditory meatus should be scored as 5.

**Supraorbital Margin:** Begin by holding your finger against the region of the orbit at the lateral aspect of the supraorbital foramen. Then hold the edge of the orbit between your fingers to determine its thickness. Look at each of the diagrams to determine which it seems to match most closely. In an example of minimal expression (score = 1), the border should feel extremely sharp, like the edge of a slightly dulled knife. A thick, rounded margin with a curvature approximating a pencil should be scored as 5.

**Prominence of Glabella:** Viewing the cranium from the side, compare the profile of the superorbital region with the diagrams. In a minimal prominence of glabella (score = 1), the contour of the frontal is smooth, with little or no projection at midline. Minimal expression involves a massive glabellar prominence, forming a rounded, leaf-shaped projection that is frequently associated with well-developed supraorbital ridges.

**Mental Eminence:** Hold the mandible between the thumbs and index fingers with thumbs on either side of the mental eminence. Move the thumbs medially until they delimit the borders of the mental eminence. In examples of minimal expression (score = 1), there is little or no projection of the mental eminence above the surrounding bone. In contrast, a massive mental eminence that extends most of the anterior portion of the mandible is scored as 5.
POSTCRANIAL

Age
Todd (1920)

I (18-19): Symphyseal surface rugged, transverse by horizontal ridges separated by well-marked grooves; no ossific nodules fusing with the surface; no definite delimiting margin; no definition of extremities.

II (20-21): Symphyseal surface still rugged, transverse by horizontal ridges, the grooves between which are, however, becoming filled near the dorsal limit with a new formation of finely textured bone. This formation begins to obscure the hinder extremities of the horizontal ridges. Ossific nodules fusing with the upper symphyseal face may occur; dorsal limiting margin begins to develop; no delimitation of extremities; foreshadowing of ventral bevel.

III (22-24): Symphyseal face shows progressive formation of the dorsal plateau; presence of fusing nodules; dorsal margin gradually becoming more defined; beveling as a result of ventral rarefaction becoming rapidly more pronounced; no delimitation of extremities.

IV (25-26): Great increase of ventral beveled area; corresponding delimitation of lower extremity.

V (27-30): Little or no change in symphyseal face and dorsal plateau, except that sporadic and premature attempts at the formation of a ventral rampart occur; lower extremity, like the dorsal margin, is increasing in clearness of definition; commencing formation of upper extremity with or without the intervention of a bony (ossific) nodule.

VI (30-35): More difficult to appraise correctly; essential feature is completion of oval outline of symphyseal face. More individual variation than at younger ages; terminal phases affect relatively minor details. Also, tendency for terminal phase to be cut short. Increasing definition of extremities; development and practical completion of ventral rampart; retention of granular appearance of symphyseal face and ventral aspect of pubis; absence of lipping of symphyseal margin.

VII (35-39): Paramount feature: Face and ventral aspect change from granular texture to fine-grained or dense bone. Changes in symphyseal face and ventral aspect of pubis consequent upon diminishing activity; commencing bony outgrowth into attachments of tendons and ligaments, especially the gracilis tendon and sacrotuberous ligament.

VIII (39-44): Symphyseal face generally smooth and inactive; ventral surface of pubis also inactive; oval outline complete or approximately complete; extremities clearly defined, no distinct “rim” to symphyseal face; no marked lipping of either dorsal or ventral margin.

IX (44-50): Characterized as well-marked “rim.” Symphyseal face presents a more or less marked rim; dorsal margin uniformly lipped; ventral margin irregularly lipped.

X (50+): Rarefaction of face and irregular ossification. Symphyseal face eroded and showing erratic ossification; ventral border more or less broken down; disfigurement increases with age.
POSTCRANIAL

Brooks and Suchey (1990)
**Postcranial**

Phase 1: Symphyseal face has a billowing surface (ridges and furrows), which usually extends to include the pubic tubercle. The horizontal ridges are well-marked, and ventral beveling may be commencing. Although ostia nodules may occur on the upper extremity, a key to the recognition of this phase is the lack of delamination of either extremity (upper or lower).

Phase 2: The symphyseal face may still show ridge development. The face has commencing delamination of lower and/or upper extremities occurring with or without ostia nodules. The ventral rim may be in beginning phases as an extension of the bony activity at either or both extremities.

Phase 3: Symphyseal face shows lower extremity and ventral transport in process of completion. There can be a concentration of fusing nodules forming the upper extremity and along the ventral border. Symphyseal face is smooth or can continue to show distinct ridges. Dorsal plateau is complete. Absence of lipping of symphyseal dorsal margin, no bony ligamentous outgrowths.

Phase 4: Symphyseal face is generally fine-grained although remnants of the old ridge and furrow system may still remain. Usually the ventral line is complete at this stage, but a lumen can occur in upper central ones. Pubic tubercle is fully separated from the symphyseal face by definition of upper extremity. The symphyseal face may have a distinct rim. Ventrally, bony ligamentous outgrowths may occur on inferior portion of pubic bone adjacent to symphyseal face. If any lipping occurs, it will be slight and located on the dorsal border.

Phase 5: Symphyseal face is completely rimmed with some slight depression of the face itself relative to the rim. Moderate lipping is usually found on the dorsal border with more prominent ligamentous outgrowths on the ventral border. There is little or no rim erosion. Breakdown may occur on superior ventral border.

Phase 6: Symphyseal face may show ongoing depression as non-erosive. Ventral ligamentous attachments are marked. In many individuals the pubic tubercle appears as a separate bony knob. The face may be pitted or porous, giving an appearance of dolichoskeleton with the ongoing process of stellate ossification. Creosolations may occur. The shape of the face is often irregular at this stage.

Lovejoy et al. (1985)
Phase 1: Age 20–24; billowing and very fine granularity
Phase 2: Age 25–29; reduction of billowing but retention of youthful appearance
Phase 3: Age 30–34; general loss of billowing, replacement by striae, coarsening of granularity
Phase 4: Age 35–39; uniform coarse granularity
Phase 5: Age 40–44; transition from coarse granularity to dense surface; this may take place over islands on the surface of one or both faces
Phase 6: Age 45–49; completion of densification with complete loss of granularity
Phase 7: Age 50–59; dense irregular surface of rugged topography and moderate to marked activity in periauricular areas
Phase 8: Age 60+; breakdown with marginal lipping, microporosity, increased irregularity, and marked activity in periauricular areas
**Sex**
Phenice (1969)

![Diagram of postcranial bones](image)

Fig. 1. A-1 Ventral arc on ventral surface of the female pubis. B-2 Slight ridge on ventral aspect of male pubis. C-3 Subpubic concavity seen from dorsal aspect of female pubis and ischiopubic ramus. D Dorsal aspect of male pubis and ischiopubic ramus. E-4 Ridge on medial aspect of female ischiopubic ramus. F-5 Broad medial surface of male ischiopubic ramus.

Buikstra and Ubelaker (1994)

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Figure 19.13  Sex differences in the greater sciatic notch, from Walker in Buikstra and Ubelaker's Standards book (1994). The greater sciatic notch tends to be broad in females and narrow in males. These shape differences are not as reliable as those in the subpubic region and should be thought of as secondary indicators. The best results for scoring are obtained by holding the os coxae above this figure so that the greater sciatic notch has the same orientation as the outlines, aligning the straight anterior portion of the notch that terminates at the ischial spine with the right side of the diagram. While holding the bone in this manner, move it to determine the closest match. Ignore any exostoses near the preauricular sulcus and the inferior posterior iliac spine. Configurations more extreme than 1 or 5 should be scored as 1 and 5, respectively. The illustration numbered 1 shows typical female morphology, whereas the higher numbers are male conformations.
**POSTCRANIAL**

**Stature**  
Genoves (1967)

**Femur**
- Female: 2.59 (maximum length) + 49.742 ± 3.816
- Male: 2.26 (maximum length) + 66.379 ± 3.417

**Tibia**
- Female: 2.72 (maximum length minus tuberosity) + 63.781 ± 3.513
- Male: 1.96 (maximum length minus tuberosity) + 93.752 ± 2.812

**Robusticity**  
Bass (2005)

**Humerus**
\[
\frac{\text{least circumference of the shaft}}{\text{maximum circumference of the shaft}} \times 100
\]

**Femur**
\[
\frac{\text{anterior-posterior + mediolateral diameter of midshaft}}{\text{bicondylar (physiological) length}} \times 100
\]

150
1. The crest of the greater tubercle is:
   a – slight impression: only slightly raised and its surface is smooth.
   b – low development: only slightly raised and its surface is slightly irregular.
   c – medium development: raised and with irregular surface.
2. high development: the crest is raised and its surface is rugose.
3. very high development: the crest is very raised and rugose, often in the form of a lanceolate, olive leaf-shaped area, with well-defined margins and often grooved by a longitudinal fossa.
1. slight impression: the anterior and lateral crests of the deltoid tuberosity are only barely appreciable and the surface is smooth.

2. low development: the anterior and lateral crests are not very marked and the surface may be rugose.

3. medium development: the crests are well visible and the lateral one protrudes, slightly altering the profile of the bone; the surface may be rugose.

4. high development: the anterior and lateral crests are raised and rugose. The lateral crest protrudes, altering the profile of the bone.

5. very high development: the anterior and lateral crests are very raised and/or rugose, and the lateral crest is very protruding.
1. slight impression: the latero-inferior margin is smooth.
   b – low development: the latero-inferior margin presents, anteriorly, a barely appreciable crest.
   c – medium development: the margin can present a flattened and rugose inverted “v” anterior zone, or a little crest curved or lipped anteriorly.

2. high development: the latero-inferior margin presents a crest curved anteriorly.

3. very high development: the lateral part of the inferior quarter of the bone is “sail-like” and presents a very developed crest curved anteriorly.
1. slight impression: there is only a slight swelling at the bicipital tuberosity, with smooth surface.
2. low development: the bicipital tuberosity appears as an oval swelling with rounded margins; the muscle markings, in the form of surface irregularities, are weak and they are usually more evident on the medial margin.
3. medium development: the lateral margin of the tuberosity is rounded, but the medial margin is more developed; the surface of the tuberosity is irregular and often grooved by a little longitudinal fossa or sulcus.
4. high development: the tuberosity, especially the medial margin, is very prominent. The surface can be more or less rugose and may be grooved by a longitudinal fossa or sulcus.
5. very high development: the tuberosity is very prominent and its margins, especially the medial, are very well developed and may form a raised border.
1. slight impression: the posterior surface of the olecranon is rounded and presents only a few markings, generally in the form of longitudinal striae.
   b – low development: in lateral view, the angle between the posterior and superior surfaces of the olecranon tends toward a right angle, and vertical striae are usually present on the crest.
   c – medium development: the posterior and superior surfaces of the olecranon form a right angle, with evident muscle markings, generally in the form of longitudinal striae.

2. high development: the posterior and superior surfaces of the olecranon meet to form a crest that is slightly raised with respect to the superior surface of the olecranon. Markings are visible on the crest, usually in the form of longitudinal striae or small ridges.

3. very high development: the crest is raised and its surface is rough, usually with small ridges or incipient digitations. Often, true enthesophytes are present.
1. slight impression: the ulnar tuberosity is only barely appreciable and its surface is only slightly irregular.
2. low development: the tuberosity is in the form of an oval area, often slightly depressed at the center.
3. medium development: idem, but a bit more raised and rugose.
4. high development: the tuberosity presents well-defined margins and is very rugose.
5. very high development: the tuberosity is very raised and rugose, possibly with very elevated margins.
1. a – slight impression: the insertion area is barely perceptible to the touch and presents a smooth surface. b – low development: the insertion area is easily distinguished and the surface is generally rather smooth. c – medium development: the gluteal ridge is evident and its surface is irregular or rugose.

2. high development: raised ridge with rough surface.

3. very high development: well-defined and very raised ridge; there may be a deep and rugose fossa, with its medial border forming a crest.
1. a – slight impression: the lesser trochanter presents rounded margins and the surface is smooth.
   b – low development: the lesser trochanter presents rounded margins (the medial one more sharply angled) and the
   surface has weak markings, generally in the form of transverse striae.
   c – medium development: the medial margin of the lesser trochanter is sharply angled and the markings (striae or
   rugosity) are evident.

2. high development: the apex of the lesser trochanter may be flattened and the surface presents transverse striations;
   the medial margin is sharply angled, and the muscle markings (rugosity) may extend downward on the side of the lesser
   trochanter.

3. very high development: the medial margin is lipped and the muscle markings (rugosity) can present an inferior
   extension on the side of the trochanter towards the femoral shaft. At times, the lesser trochanter may be flattened or
   have a very flattened and rugose superior facet.
1. a – slight impression: the tuberosity, consisting in a smooth superior part and an inferior part usually marked by longitudinal striae, does not interrupt the continuity of the shaft; b – low development: the superior part (smooth) of the tuberosity and the inferior part (with the longitudinal striae) are separated by a sulcus; c – medium development: the inferior part has a rough surface and there may be a lateral swelling.

2. high development: a true crest is present at the proximal end of the inferior part of the tuberosity.

3. very high development: the tuberosity presents a true crest, often running diagonally from the infero-lateral to supero-medial part of the bone, with incipient digitations. Often true enthesophytes are present.
**POSTCRANIAL**

**Musculoskeletal Markers**

**Femur**

Poirier’s Facet

Posterior Cervical Imprint
POSTCRANIAL

Peritrochlear Groove
POSTCRANIAL

Tibia
Squatting Facets
Pelvic bones of negro male, aged twenty-seven years, showing bilateral single accessory sacro-iliac facets.
REFERENCES CITED

Adams, J. L.

Agarwal, S. C. and B. A. Glencross

Al-Gazali, L. I., R. Alwash and Y. M. Abdulrazzaq

al Khabori, M. and M. Patton

Anyon, R., P. A. Gilman and S. A. LeBlanc

Anyon, R. and S. A. LeBlanc


Armelagos, G. J.


Armelagos, G. J. and D. P. VanGerven

Auerbach, B. M.
Auerbach, B. M. and C. B. Ruff

Aufderheide, A. C. and C. Rodríguez-Martin

Bass, W. M.

Bauer-Clapp, H. J.
2005 Indicators of Nutritional Stress within the Mimbres: Is There a Correlation Between Enamel Hypoplasia and Harris Lines, Department of Anthropology, Minnesota State University, Mankato, MN.

Baustian, K. M.

Baustian, K. M., R. P. Harrod, A. J. Osterholtz and D. L. Martin

Baustian, K. M. and D. L. Martin

Baustian, K. M. and B. J. Roth

Bener, A., Y. M. Abdulrazzaq, L. I. Al-Gazali, R. Micallef, A. I. Al-Khayat and T. Gaber
Benjamin, M., H. Toumi, J. R. Ralpsh, G. Bydder, T. M. Best and S. Milz

Bernbeck, R.

Blake, M., S. A. LeBlanc and P. Minnis

Bradfield, W.
1929 *Cameron Creek Village: A Site in the Mimbres Area in Grant County New Mexico*. The School of American Research, Santa Fe.

Brandt, E. A.

Bristol-Rhys, J.

Brooks, S. and J. M. Suchey

Brothwell, D. R.

Buikstra, J. E.

Buikstra, J. E. and D. H. Ubelaker
Cannon, M. D.  


Capasso, L., K. A. R. Kennedy and C. A. Wilczak  

Cardoso, F. A. and C. Y. Henderson  

Chacon, R. J. and D. H. Dye  

Cosgrove, H. S. and C. B. Cosgrove  
1932  The Swarts Ruin, A Typical Mimbres Site in Southwestern New Mexico. Papers of the Peabody Museum of Archaeology and Ethnology. vol. 15(1). Harvard University, Cambridge, MA.

Creel, D.  
1989  A Primary Cremation at the NAN Ranch Ruin, Grant County, New Mexico with Comparable Data on Other Cremations in the Mimbres Areas. *Journal of Field Archaeology* 16:309-329.


Creel, D. and R. Anyon


Creel, D. and C. McKusick

Crotty, H. K.

del Angel, A. and H. B. Cisneros

Diehl, M. W.


2001 Competing Models of Upland Mogollon Pithouse Period Life-Styles. In *Early Pithouse Villages of the Mimbres Valley and Beyond: The McAnally and Thompson Sites in their Cultural and Exological Contexts*, edited by M. W. Diehl


Diehl, M. W. and S. A. LeBlanc

Duncan, W. N.

Ehrlich, E. and H. Maxeiner

Ember, C. R. and M. Ember

Ferguson, R. B.

2006 Archaeology, Cultural Anthropology, and the Origins and Intensification of War. In The Archaeology of Warfare: Prehistories of Raiding and Conquest,


Goodman, A. H. and G. J. Armelagos

Goodman, A. H., R. B. Thomas, A. C. Swedlund and G. J. Armelagos

Guilaine, J. and J. Zammit

Guyomarc’h, P., M. Campagna-Vaillancourt, C. Kremer and A. Sauvageau

Ham, E. J.
1989  Analysis of the NAN Ranch (LA 15049) Burial Patterns: An Examination of Mimbres Social Structure, Anthropology, Texas A&M University, College Station.

Harrod, R. P.


2013  Chronologies of Pain and Power: Violence, Inequality, and Social Control Among Ancestral Pueblo Populations (AD 850-1300), Department of Anthropology, University of Nevada, Las Vegas, Las Vegas, NV.

Harrod, R. P., P. Liénard and D. L. Martin

Harrod, R. P. and D. L. Martin
2014  Signatures of Captivity and Subordination on Skeletonized Human Remains: A Bioarchaeological Case Study from the Ancient Southwest. In

In Press


Haury, E. W.

Hawkey, D. E. and C. F. Merbs

Hayden, B. and A. Cannon

Hegmon, M.


Hegmon, M. and M. C. Nelson


Hegmon, M., M. C. Nelson and M. J. Ennes

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Hegmon, M., M. C. Nelson and S. Ruth

Hegmon, M., M. A. Peeples, A. P. Kinzig, S. Kulow, C. M. Meegan and M. C. Nelson

Hinkes, M. J. M.

Holliday, D. Y.

1996 Were Some More Equal? Diet and Health at the NAN Ranch Pueblo, Mimbres Valley, New Mexico, University of Wisconsin, Madison.

Jantz, R. L. and D. W. Owsley

Judd, M.

Judd, M. A.

Jurmain, R.

Jurmain, R., F. A. Cardoso, C. Henderson and S. Villotte
Keeley, L. H.  

Klaus, H. C.  

Kohler, T. A., S. G. Ortman, K. E. Grundtisch, C. M. Fitzpatrick and S. M. Cole  

Kremer, C., S. Racette, C.-A. Dionne and A. Sauvageau  

Kremer, C. and A. Sauvageau  

Kuckelman, K. A., R. R. Lightfoot and D. L. Martin  


Lambert, P. M.  

Larsen, C. S.  

LeBlanc, S. A.


LeBlanc, S. A. and K. E. Register

LeBlanc, S. A., C. G. Turner II and M. E. Morgan

Lekson, S. H.
1999  *The Chaco Meridian: Centers of Political Power in the Ancient Southwest*. AltaMira Press, Walnut Creek, CA.


Lightfoot, K. G. and G. M. Feinman

Lightfoot, R. R. and K. A. Kuckelman
Lippmeier, H. S.
1990 An Assessment of Nutritional Status and Genetic Relatedness Between Mimbres and Black Mountain Populations of New Mexico, Anthropology, State University of New York, Buffalo.


Lovell, N. C.
1997 Trauma Analysis in Paleopathology. Yearbook of Physical Anthropology 40:139-170.

Marek, M.
1990 Long Bone Growth of Mimbres Subadults from the NAN Ranch (LA15049), New Mexico, Anthropology, Texas A&M University, College Station.

Mariotti, V., F. Facchinì and M. G. Belcastro

Martin, D. L.


Martin, D. L. and N. J. Akins


Martin, D. L., A. H. Goodman, G. J. Armelagos and A. Magennis

Martin, D. L. and R. P. Harrod
2014 Bioarchaeological Contributions to the Study of Violence. American Journal of Physical Anthropology 00(00):00-00.

Martin, D. L., R. P. Harrod and M. Fields
2010 Beaten Down and Worked to the Bone: Bioarchaeological investigations of women and violence in the ancient Southwest. Landscapes of Violence 1(1):Article 3.

Martin, D. L., R. P. Harrod and V. R. Perez


McGowan, K. M.
2009 The Use of Musculoskeletal Stress Markers in Determining the Effects of Subsistence Change on the Inhabitants of the NAN Ranch Ruin, California State University, Chico, Chico.

Meindl, R. S. and C. O. Lovejoy

Milella, M., M. G. Belcastro, C. P. E. Zollikofer and V. Mariotti

Mills, B. J.

Minnis, P.
1985  *Social Adaptation to Food Stress: A Prehistoric Southwestern Example.* University of Chicago Press, Chicago.

Munson, M. K.

Nagengast, C.

Nelson, B. A. and S. A. LeBlanc
1986  *Short Term Sedentism in the American Southwest: The Mimbres Valley Salado.* University of New Mexico Press, Albuquerque.

Nelson, M. C.

Nelson, M. C. and M. Hegmon


Nelson, M. C., M. Hegmon, S. Kulow and K. G. Schollmeyer

Novak, S. A.

Olive, B. W.
1989  The Oral Health and Dental Characteristics of a Mimbres Population from Southwest New Mexico, Anthropology, Texas A&M University, College Station.
Olsen, S. L. and P. Shipman

Ortner, D. J.

Osterholtz, A. J.


Otterbein, K. F.

Owsley, D. W.

Paynter, R.

Perez, V. R.


Phenice, T. W.
Pinhasi, R., S. Stefanovic, A. Papathanasiou and J. T. Stock  
2011   Variability in Long Bone Growth Patterns and Limb Proportions Within  
and Amongst Mesolithic and Neolithic Populations from Southeast Europe. In  
*Human Bioarchaeology of the Transition to Agriculture*, edited by R. Pinhasi and  

Potter, J. M. and J. P. Chuipka  
2010   Perimortem Mutilation of Human Remains in an Early Village in the  

Potts, D. T., K. M. Baustian, D. L. Martin and A. J. Osterholtz  
2013   Neonates, Infant Mortality and the Pre-Islamic Arabian Amuletic  

Powell-Marti, V. S. and W. D. James  
2006   Ceramic Iconography and Social Asymmetry in the Classic Mimbres  
Heartland, AD 970-1140. In *Mimbres Society*, edited by V. S. Powell-Marti and  

Provinzano, J.  
1968   The Osteological Remains of the Galaz Mimbres Amerinds,  
Anthropology, University of Minnesota, Minneapolis.

Rautman, A. E.  
1993   Resource Variability, Risk and the Structure of Social Networks: An  

Rice, G. E. and S. A. LeBlanc (editors)  
2001   *Deadly Landscapes: Case Studies in Prehistoric Southwestern Warfare*.  
The University of Utah Press, Salt Lake City.

Riches, D.  

Robb, J. E.  

Roberts, C. A. and K. Manchester  
Roth, B. J.


Roth, B. J. and K. M. Baustian
In Press Kin Groups and Social Power at the Harris Site, Southwestern New Mexico. American Antiquity 0(0):00-00.

Roth, B. J., K. M. Baustian and D. Powell

Saunders, S. R. and R. D. Hoppa

Schaafsma, P.


Schachner, G.

Schroder, I. W. and B. E. Schmidt

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Schulting, R. J. and M. Wysocki
2005 'In this Chambered Tumulus were Found Cleft Skulls...': An Assessment of the Evidence for Cranial Trauma in the British Neolithic. *Proceedings of the Prehistoric Society* 71:107-138.

Shafer, H. J.


Shafer, H. J. and R. L. Brewington

Shafer, H. J. and H. Drollinger

Shafer, H. J., M. Marek and K. J. Reinhard

Sluka, J. A.

Snow, M., H. J. Shafer and D. G. Smith

Sofaer, J. R.

Stewart, T. D.

Stock, J. T. and C. N. Shaw

Stodder, A. L. W., A. J. Osterholtz, K. Mowrer and J. P. Chuipka

Stokes, R. J. and B. J. Roth

Stoltenberg, C., P. Magnus, A. Skrondal and R. Terje Lie

Storey, R.
Taylor, M. and D. Creel

Todd, T. W.

Turner II, C. G. and J. A. Turner
1999 *Man Corn: Cannibalism and Violence in the Prehistoric American Southwest*. University of Utah Press, Salt Lake City.

VanGerven, D. P., J. Hummert and D. Burr

Walker, P. L.


Webb, S.

Wheat, J. B.

White, T. D.

Whitehead, N. L.

Wiessner, P.

Wilcox, D. R. and J. Haas

Wilkinson, R. G.

Woosley, A. I. and A. J. McIntyre

Woosley, A. I. and J. C. Ravesloot (editors)

Zuckerman, M. K. and G. J. Armelagos
**Curriculum Vitae**

**Kathryn M. Baustian**

University of Nevada, Las Vegas  
4505 Maryland Parkway #455003  
Las Vegas, NV 89154  
651-402-6882  
baustian@unlv.nevada.edu

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**EDUCATION**

2015  PhD, Anthropology, University of Nevada, Las Vegas.  
“The Bioarchaeology of Social Order: Cooperation and Conflict among the Mimbres (AD 550-1300)”

2010  MA, Anthropology, University of Nevada, Las Vegas.  
“Health Status of Infants and Children from the Bronze Age Tomb at Tell Abraq, United Arab Emirates”

2005  BA, Cum Laude, Anthropology, Criminal Justice, Certificate of Forensic Sciences, Hamline University, Saint Paul, MN.

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**ACADEMIC & TEACHING EXPERIENCE**

**Adjunct Instructor (International Academy of Design and Technology, Las Vegas)**

- **Physical Anthropology** - Fall 2013, Summer 2013

**Adjunct Instructor (University of Nevada, Las Vegas)**

- **Introduction to Cultural Anthropology** - Spring 2014, Fall 2013

**Instructor – Graduate Assistant (University of Nevada, Las Vegas)**

- **Introduction to Cultural Anthropology** - Spring 2012, Fall 2011
- **Introduction to Biological Anthropology Lab** - 9 sections Spring 2009 - Spring 2013
- **Bones, Bodies, and Trauma: Studies in Forensic Anthropology**
  (Co-Instructor with Cheryl Anderson & Dr. Jennifer Thompson) - Fall 2012
- **Bones, Bodies, and Trauma: Studies in Forensic Anthropology**
  (Co-Instructor with Ryan Harrod, Dr. Jennifer Thompson, & Dr. Debra Martin) - Fall 2010

**Teaching Apprentice (Hamline University)**

- **Human Osteology and Skeletal Identification** - Fall 2004
- **Survey of Forensic Sciences** - Fall 2003

**Graduate Assistant (University of Nevada, Las Vegas)**

Department of Anthropology, 2010-2013  
Department of Anthropology, Summer 2012  
Department of Anthropology, 2007-2009
TECHNICAL & RELATED PROFESSIONAL EXPERIENCE

Visiting Scientist, Forensic Anthropology Unit, New York City Office of the Chief Medical Examiner. Supervisor: Dr. Bradley Adams. November 2012

Bioarchaeologist, Two weeks of burial excavation and analysis of skeletal remains from the Harris Site, Mimbres, NM. Site Director: Dr. Barbara Roth. Summer 2013, Summer 2012, Summer 2011

Archaeologist & Laboratory Analyst, One month of survey and excavation at Akrotiri Aetokremnos and ‘Ais Yorkis on the island of Cyprus, followed by lithic analysis. Supervisor: Dr. Alan Simmons. Summer 2009


Field Technician, Summit Envirosolutions (Cultural Resource Management and Archaeological Excavation) Saint Paul, MN. May 2005

Forensic Anthropology Intern, C.A. Pound Human Identification Laboratory, University of Florida, Gainesville. Supervisor: Dr. Anthony Falsetti. July-August 2004

Assistant to Forensic Anthropologist, Recovery, preparation, and analysis of decomposed and skeletonized human remains. Supervisors: Dr. Susan Myster (MN) and Dr. Jennifer Thompson (NV). 2003-2010

PUBLICATIONS – JOURNALS


2015 Roth, BJ, and Baustian, KM. Kin Groups and Social Power at the Harris Site, Southwestern New Mexico. American Antiquity 0(0):00-00.


PUBLICATIONS – BOOKS and CONTRIBUTED CHAPTERS


**PROFESSIONAL CONFERENCE PRESENTATIONS**


2014 **Baustian, KM**, and Roth, BJ. Bioarchaeological Contributions to Late Pithouse Period Mimbres Studies: Data from the Harris. *Paper Presentation*. 79th Annual Meeting of the Society for American Archaeology. April 23-27, Austin, TX


2013 Baustian, KM, and Roth, BJ. Mimbres Seated Burials: Indicators of Social Memory and Family Land Tenure. *Poster Presentation.* 1st Annual Meeting of the Western Bioarchaeological Interest Group. October 11-12 Berkeley, CA


2012 Baustian, KM. Commemorating the Dead at the Harris Site: Bioarchaeological and Mortuary Contributions. *Paper Presentation.* 17th Biennial Mogollon Archaeology Conference. October 4-6 Silver City, NM


2012 Martin, DL, Baustian, KM, Harrod, RP, and Osterholtz, AJ. Injury Recidivism, Trauma, and Pathology in the Multi-Ethnic Community of Grasshopper Pueblo (AD 1275-1400). *Poster*
2012 Anderson, CP, **Baustian, KM**, and Martin, DL. Sex Estimation and Pathology in the Second Cervical Vertebrae from Bronze Age Tell Abraq, UAE. *Poster Presentation.* 39th Annual Meeting of the Paleopathology. April 10-11 Portland, OR


2009 **Baustian, KM and Martin, DL.** High Infant Mortality in Ancient Arabia: Endemic Infections and Marriage Patterns at Tell Abraq (c.2300BC). *Paper presentation.* 78th Annual Meeting of the American Association of Physical Anthropologists. March 31-April 4 Chicago, IL


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**INVITED LECTURES**

- “Preparing and Processing Human Remains for Forensic Casework.” Invited guest lecture presented to Dr. Debra Martin’s Bones, Bodies, and Trauma class. University of Nevada, Las Vegas, NV February 18, 2015.
- “Bioarchaeology of the Mimbres: Applications of Human Osteology.” Invited guest lecture presented to Dr. Susan Myster’s Human Osteology class. Hamline University, Saint Paul, MN September 12, 2014.
- “Early Hominid Evolution.” Invited guest lecture in Dr. David Samson’s Introduction to Physical Anthropology class. UNLV, Las Vegas, NV April 7, 8, 9, 10, 2014.
- “From Bodies to Bones: Forensic Anthropology in the Real World” UNLV Road Scholar Program: Crime Scene Forensics. Las Vegas, NV October 14, December 5, 2012.
- “Bioarchaeology of the Mimbres.” Invited guest lecture presented to Dr. Susan Myster’s Bioarchaeology class. Hamline University, Saint Paul, MN September 20, 2012.
- “Biological Anthropology.” Invited guest lecture and lab activities presented to Dr. Levent Atici’s World Archaeology class. UNLV, Las Vegas, NV February 1, 2012.
- “Bioarchaeological Analysis: Bronze Age United Arab Emirates and the Prehistoric American Southwest.” Invited guest lecture presented to Dr. Susan Myster’s Bioarchaeology class. Hamline University, Saint Paul, MN November 16, 2011.
- “Biological Anthropology.” Invited guest lecture and lab activities presented to Dr. Levent Atici’s World Archaeology class. UNLV, Las Vegas, NV September 17, 2011.
- “Biological Anthropology.” Invited guest lecture and lab activities presented to Dr. Levent Atici’s World Archaeology class. UNLV, Las Vegas, NV February 2009.

GRANTS, AWARDS, & FELLOWSHIPS

2014
- (Declined) Summer Session Scholarship, University of Nevada, Las Vegas ($2000)
- UNLV Foundation President’s Graduate Research Fellowship, University of Nevada, Las Vegas ($23,000, tuition, and associated fees)
- UNLV Graduate Access Grant ($2000)
- Graduate and Professional Student Association Grant, University of Nevada, Las Vegas ($400)

2013
- Graduate and Professional Student Association 2013 Service Award, University of Nevada, Las Vegas ($300)
- Graduate and Professional Student Association Grant, University of Nevada, Las Vegas ($700)
- UNLV Graduate Access Grant ($1,000)
- Graduate and Professional Student Association Grant, University of Nevada, Las Vegas ($700)
- Honorable Mention (with Cheryl Anderson), Graduate Student Poster, Anthropology Research Forum
- Patricia A. Sastaunik Scholarship ($2500)
- Graduate and Professional Student Association Grant, University of Nevada, Las Vegas ($450)
- New Mexico Archaeological Council Grant ($1000)
- Arizona Archaeological and Historical Society Grant ($1000)
- Honorable Mention (with Anna Osterholtz), Social Sciences Poster Session, Graduate and Professional Student Association Research Forum
- Honorable Mention, Social Sciences Podium Session, Graduate and Professional Student Association Research Forum, University of Nevada, Las Vegas
- UNLV Graduate Access Grant ($1,000)
- UNLV Graduate Access Grant ($1,000)
- Graduate and Professional Student Association Grant, University of Nevada, Las Vegas ($700)
- Graduate Assistantship, University of Nevada, Las Vegas, Fall 2013-Spring 2014 ($14,000)
2012
- Graduate and Professional Student Association Grant, University of Nevada, Las Vegas ($525)
- Rocchio Memorial Scholarship, University of Nevada, Las Vegas ($500)
- UNLV Graduate Access Grant ($1,000)
- Graduate Assistantship, College of Liberal Arts Dean’s Award, University of Nevada, Las Vegas, Summer 2012 ($2,000)
- Graduate and Professional Student Association Grant, University of Nevada, Las Vegas ($200)
- Anthropology Society Grant, University of Nevada Las Vegas ($200)
- Honorable Mention, Social Sciences Podium Session, Graduate and Professional Student Association Research Forum, University of Nevada, Las Vegas
- Graduate and Professional Student Association Grant, University of Nevada, Las Vegas ($750)
- Graduate Assistantship, University of Nevada, Las Vegas, Fall 2012-Spring 2013 ($12,000)
2011
- Graduate and Professional Student Association Grant, University of Nevada, Las Vegas ($800)
- Rocchio Memorial Scholarship, University of Nevada, Las Vegas ($1,600)
- UNLV Graduate Access Grant ($1,000)
- UNLV Graduate Access Grant ($1,000)
- Graduate Assistantship, University of Nevada, Las Vegas, Fall 2011-Spring 2012 ($12,000)
- Future Anthropologists Fund, Anthropology Society, University of Nevada, Las Vegas ($150)
- Graduate and Professional Student Association Grant, University of Nevada, Las Vegas ($300)
- Graduate and Professional Student Association Grant, University of Nevada, Las Vegas ($500)
2010
- Edwards and Olswang Grant in Anthropology, University of Nevada, Las Vegas ($1,280)
- Graduate Assistantship, University of Nevada Las Vegas, Fall 2010-Spring 2011 ($12,000)
2009
- Graduate and Professional Student Association Grant, University of Nevada, Las Vegas ($450)
- Future Anthropologists Fund, Anthropology Society University of Nevada, Las Vegas ($100)
- Rocchio Memorial Scholarship, University of Nevada, Las Vegas ($1,150)
- Margaret Lyneis/Future Anthropologists Fund, Anthropology Society, University of Nevada, Las Vegas ($150)
International Study Abroad Scholarship, University of Nevada, Las Vegas ($600)
Graduate and Professional Student Association Grant, University of Nevada, Las Vegas ($400)

2008
Graduate Assistantship, University of Nevada, Las Vegas, Fall 2008-Spring 2009, ($10,000)
Graduate and Professional Student Association Grant, University of Nevada, Las Vegas ($600)
Edwards and Olswang Grant in Anthropology, University of Nevada, Las Vegas ($400)

2007
Graduate Assistantship, University of Nevada, Las Vegas, Fall 2007-Spring 2008 ($10,000)

2005
Belle & Leland Cooper Award in Anthropology, Hamline University ($150)

2004
Carol Anderson Research Grant, Hamline University ($2500)

RESEARCH INTERESTS
Bioarchaeology and Forensic Anthropology: violence and trauma, disease processes, environmental effects on health, social factors and their effects on health, social organization and marginalization.
Regional Interests: American Southwest, Near East, Mediterranean Region

PROFESSIONAL MEMBERSHIPS
American Association of Physical Anthropology
American Anthropological Association
American Academy of Forensic Sciences, Physical Anthropology Section
Society for American Archaeology
New Mexico Archaeological Council
Arizona Archaeological and Historical Society
Anthropology Society, University of Nevada, Las Vegas
Graduate Student Events Committee, Society for Cross Cultural Research Annual Meeting. Las Vegas, NV (February 22-25, 2012)
Forensic Sciences Society, Hamline University
Anthropological Society, Hamline University
Phi Kappa Phi, University of Nevada Las Vegas (Inducted 2011)
Lambda Alpha, University of Nevada Las Vegas (Inducted 2008)
Phi Beta Kappa, University of Nevada Las Vegas (Inducted 2005)
Pi Gamma Mu, Hamline University (Inducted 2004)
SERVICE POSITIONS
Student Conduct Hearing Board, University of Nevada Las Vegas
Graduate and Professional Student Association, University of Nevada Las Vegas
  - Assistant Committee Chair, Graduate and Professional Student Association Annual Research Forum
  - Committee Chair, Activities and Community Service
  - Graduate College Data Analyst Position Search Committee
  - Committee Member, Sponsorship Committee
  - Committee Member, Election Committee
Red Rock Search and Rescue, Human Remains Search Volunteer
Judging Committee Member, Anthropology Research Forum, University of Nevada Las Vegas