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A History of Violence: 3000 Years of Interpersonal and Intergroup Conflicts from the Initial to the Early Colonial Periods in the Peruvian Central Coast. A Bioarchaeological Perspective

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Abstract

The purpose of this study is to test research questions about the development of violence on the Peruvian central coast during the pre-Hispanic and Early Colonial times. This is the first study to provide a diachronic analysis of violence on the central coast. One null hypothesis was tested and falsified: that there are no differences in the prevalence and pattern of trauma over time on the central coast of Peru. Two complementary questions were also addressed: 1) Is there a relation between sociopolitical changes, natural catastrophes, competition for resources and violence? and 2) How did violence affect specific segments of the population (males, females, subadults, and elite and non-elite persons)? More than 700 individuals from 14 different samples were analyzed, following classic bioarchaeological and forensic methods, and complemented with other variables such as cohort, most probable cause (malintent, accidental, occupational or unknown), lethality, minimum number of events, and social status. This research showed three factors that triggered violent episodes in the area: 1) the emergence of social inequalities/a warrior elite; 2) socio-political crises that were produced after the fall of a previous social order; and 3) the need to fight for resources, either during severe droughts or to control the resources of the middle valley region. Males (adults and adolescents), especially those dedicated to military activities or those from the lower status were more exposed to violence than the rest of the population. However, in times when violence rose, females were equally affected. The comparison of the findings from the central coast with other Andean regions showed that not all societies reacted in the same way when faced with similar socio-political /environmental challenges. The main contributions of this study are its long temporal perspective, and its emphasis on the importance of social complexity. These perspectives will enrich the anthropological debate around violence, providing a better understanding of the factors that can affect how violence can unfold in different situations and within different cultures.

Keywords

Violence, Peruvian central coast, Pre-Hispanic Andes, Early Colonial period, trauma, bioarchaeology, bio-cultural interactions

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Chapter 1

1 Introduction

Every society experiences violence that generally results from tensions that develop between individuals and/or between political, economic, or social groups. These conflicts are part of the human legacy, and the study of the patterns of violence in past populations greatly informs our understanding of the political, economic and, social forces that shape societies today.

The study of violence has captivated the interest of researchers from different fields, such as history, sociology, anthropology, psychology, medicine, biology, and neuroscience; each of them contributing their unique perspective and methodology to the understanding of this phenomenon. Nevertheless, when assessing social violence in a past population, while information may come from a variety of sources, the most direct method is to look for evidence of trauma on human remains.

Bioarchaeological research regarding the nature and impact of violence in the past varies from the examination of isolated cases of interpersonal violence to patterns expressed in large-scale conflicts. In this way, bioarchaeologists have focused on the study of patterns of warfare and historical battles (e.g. Fiorato et al. 2007; Liston and Baker 1996; Owsley 1994; Owsley et al. 1991; Snow and Fitzpatrick 1989; Thomas and Williamson 1991; and Willey and Scott 1996). In contrast, few studies have focused on specific kinds of interpersonal violence such as violence against women (e.g. Martin 1997; Tung 2012a; Walker 1997; Wilkinson 1997; and Wilkinson and Van Wagenen 1993), or child abuse (e.g. Walker et al. 1997; and Wheeler et al. 2007, 2013). Nonetheless, among the most common subjects of interest in the study of violence from a bioarchaeological perspective are special cultural variations such as human sacrifice (e.g. Boone 1984; Cabrera 1994; Klaus et al. 2010, 2011; Pijoan and Mansilla 1997; Serrano 1994; Toyne 2008; Vega-Centeno et al. 2006; and Verano 1995, 1998, 2001a, 2005a and b, 2007, 2008a, 2014a); cannibalism (e.g. Baraybar 1993; Pijoan and Mansilla 1997; Simon and Steffian 1994; Turner 1993; and Turner and Turner 1995); trophy heads (e.g. Baraybar 1987; Drusini and Baraybar 1991; Kellner 2009; Tung 2008; Tung and Knudson 2008; and Verano 1995, 2003a, 2008a); scalping (e.g. Bridges 1996; Milner 1995; Milner et al. 1991; Owsley 1994; and Toyne 2011); and beheading (e.g. McKinley 1993).

Another topic of interest in bioarchaeology is the understanding of the origin of violence itself. Bioarchaeologists (and anthropologists in general) have not had a great impact in this area, in comparison to the contribution of historians and sociologists (Walker 2001). Nevertheless, some authors have described the relationship between violent outbreaks and climatic instability, increased population density, and/or resource competition (e.g. Harrod and Martin 2014; Jones et al. 1999; Lambert 1997; LeBlanc 1999; Molto 2015; Standen et al. 2009, 2010; and Torres-Rouff and Costa 2006). The association between violence and socio-cultural and political changes has received greater attention; such as the impact of pre-Columbian imperialism (e.g. Andrushko 2007; Andrushko et al. 2006; Murphy 2004; Salter-Pedersen 2011a; and Tung 2007, 2012b) and the effect of European contact in the New World (e.g. Hutchinson 1991, 1996; Klaus and Álvarez-Calderón 2011; Murphy et al. 2010, 2011; Owsley et al. 1994; Stodder 1994; and Stodder and Martin 1992).

There is a large body of literature in history and sociology regarding violence. After the seminal work of Walker (e.g. 2001), more than10 years went by before the birth of a second "wave" in the research of violence in the past (see for example Knüsel and Smith 2014; Martin and Anderson 2014; Martin and Harrod 2012, 2015; Martin et al. 2012a; and Scherer and Verano 2014). Archaeology is the only discipline that has a scale of inquiry that spans the entire human past, and as such provides us with the opportunity to test research questions such as: what patterns and processes link or divide people and cultures across space and time? Bioarchaeological studies of how conflicts involve women and children are even scarcer, as interest has mainly focused in the active participation of men as fighters. Is the growth or collapse of an empire reflected in a rise of violence? Are inter and intra group conflicts an extension of other kinds of violence, such as wife battering and child abuse? Are people from a lower status exposed to more violence than high status persons? I will seek to address these questions using the comprehensive archaeological and historic record of Peru.

1.1 Violence in Peru

From the well-known mass-sacrifices of the Moche culture (see for example, Verano 1986, 1998, and 2008a) to the most recent crimes against humanity that occurred during the internal conflict between terrorists and government forces (1980-2000), Peru offers an excellent research environment to test hypotheses about the cultural context of violence, about its patterning, and about its effects on individual people. The research herein will focus on the Peruvian central coast, one of the less studied regions in the country but an area with a complex socio-political development and a challenging geographic environment, in order to reconstruct a 3000+ year "history of violence[1]" for the area. Research in the modern context has examined the sociopolitical context and patterns of violence (CVR 2003; Dingley 2010; Dobash and Dobash 1992), and there is some historical analysis of changes in these patterns (North et al. 2009; Ramsbotham et al. 2011), but to date, analyses of these changes over deep archaeological time using direct physical evidence are scarce.

Archaeologically, the Peruvian central coast includes the valleys surrounding the city of Lima, the Peruvian capital city (Chillón, Rímac, and Lurín). It also refers to a larger area extending from Chanchay to Chilca (Lanning 1967:32) (Figure 1.1), depending on the level of integration with the core area that those peripheral valleys exhibited in a specific time period.

An overview of the scholastic research of this region shows that studies have focused on the description and sequence of ceramic styles (e.g. Guerrero and Palacios 1994; Makowski et al. 2008; Palacios 1988; Patterson 1966; and Vallejo 2004, 2009), the analysis of mortuary practices (e.g. Díaz and Vallejo 2002a, 2005; Eeckhout 2010a; Kaulicke 1997; and Quilter 1989), and the interpretation of architecture (e.g. Eeckhout

[1] For the means of this dissertation, violence will refer only to non-ritual physical violence. Ritual violence includes different forms of public activities that are used to materialize the group identity and the power structure, such as trophy taking, head-hunting, human sacrifice, public and ritualized torture of enemies, and cannibalism (Martin et al. 2013; Martin and Harrod 2015).

1999a, 1999-2000, 2003, 2010b; Makowski 2002a; Marcone 2000; Villacorta 2003; and Williams 1971, 1978-1980, 1985).

Figure 1.1: Map of Peru, and the Central Coast (in Box). Based on Google Maps (accessed November 1, 2015).

In contrast, investigations focused on human remains are relatively limited and have mostly focused on paleopathology/paleoepidemiology (e.g. Fierro and Romero 2005; Pechenkina and Delgado 2006; Salter-Pedersen 2011b; Vega 2009a; 2011a, 2011b, 2015a; and Vradenburg 2009), morphology and metrics (Drusini et al. 2009; Montoya 1994; and Vivar 1996, 1998, 1999), diet (Baraybar 1999; Falk et al. 2004; Kolp-Godoy et al. 2011; and Williams 2005), the consequences of Inca imperialism (Boza 2010; Murphy 2004; and Salter-Pedersen 2011a), and ritual violence (Barreto 2011, 2012; Eeckhout 1999b; and Eeckhout and Owens 2008). Research focused exclusively on non- ritual violence has only been conducted for the early contact period (e.g. Gaither and Murphy 2012; Lund 2009; Lund and Cock 2011; and Murphy et al. 2010).

As can be noticed, there are relatively few bioarchaeological studies of the Peruvian central coast that are focused on violence and none of them covers a broad stretch of the pre-Hispanic sequence of the area. Although there are some available data about trauma, they are mostly found in unpublished theses or reports that concentrate on one specific site, employing inconsistent methodologies, and mentioning violence only tangentially (if at all). This doctoral research is the first study that compiles all this disparate information to provide an overall synthesis of non-ritual violence in the central coast.

1.2 Research Questions and Main Hypothesis

I propose that the prevalence and pattern of violence-related trauma in the central coast has not been the same through time, leading to the null hypothesis that there are no differences in the prevalence and pattern of violence-related trauma over time. If there are differences, then they likely correspond to specific socio-political and climatic events and processes that triggered violent outbursts.

I posit two research questions derived from the main hypothesis, regarding the social implications of the findings: 1) how does the evolving sociopolitical context as viewed over the long term affect patterns of trauma? and 2) how did upheavals (e.g. political changes, natural catastrophes, and demographic pressure) affect the lives of individual people, especially with regard to the violence they faced on a day to day basis (particularly with respect to violence against women and children)?

In this way, it is expected that we will find a greater prevalence of violence-related trauma during the periods of dramatic cultural and climatic changes, especially during the expansion of the Wari Empire and the Spanish Conquest, particularly among male adults and low status individuals.

1.3 Materials and Methods

In order to reconstruct most of the pre-Hispanic-Early Colonial chronological sequence from the Central Coast, 736 individuals from 14 different samples were analyzed: La Capitana (Archaic); Asia, Asia Baja, León Dormido 3, and León Dormido 17 (Formative); Tablada de Lurín (Early Intermediate, white-on-red tradition); Cerro Culebra (Early Intermediate, Middle Lima); Huaca 20 and Copacabana (Middle Horizon 1, Late Lima); Ancón (Middle Horizon 2-4); Armatambo-22 de Octubre (Late

Intermediate); Pueblo Viejo-Pucará and Puruchuco 57AS03 (Late Horizon); and Puruchuco 57AS03 (Early Colonial). The skeletal material was studied following classic bioarchaeological and forensic methods, as outlined by Buikstra and Ubelaker (1994) and Wedel and Galloway (2014), complemented with other variables such as cohort, most probable cause (malintent, accidental, occupational or unknown), lethality, minimum number of events, and social status. An analysis of the environmental, cultural, and archaeological contexts, as well as comparisons with published samples of the same area was also included.

1.4 Organization of the Dissertation

This dissertation is organized into eight chapters. Chapter 2 (Literature Review: The Study of Violence) discusses what we understand as violence and the different approaches to its study. This review is followed by Chapter 3 (Literature Review: Archaeological Background) which describes the ecological, historical, and archaeological setting of the Peruvian central coast, as well as the different evidences of violence found throughout the different time periods on the Andean region. Chapter 4 (Materials and Methods) starts with the description of the sites (and their related studies) from which the human remains under investigation were recovered. After this, each sample and the bioarchaeological methods used in this research are presented. Chapter 5 (Results, Part I: Analysis of the Samples) shows the results of the analysis of the individuals that compose the main corpus of this study, divided by chronological periods. Each time subdivision presents the paleodemographic reconstruction of the samples and the prevalences of traumatic lesions divided by cohort, most probable cause, location, lethality, minimum number of events (MNEv), and social status. Chapter 6 (Results, Part II: Intra and Inter Regional Comparisons) compares the results with those obtained by other researchers in the central coast and other Andean regions in the same chronological periods. Chapter 7 (Discussion) discusses the implications of these findings, and also includes the results of the analysis of the forensic sample. Finally, Chapter 8 (Conclusions) synthesizes all the information and presents the conclusions of the investigation. The databases containing the raw data of the archaeological samples and the recording forms employed in this dissertation are presented in 11 Appendices.

This research is the first paleoepideomiological investigation focused on violence that covers thousands of years and samples many different sociopolitical contexts using the rich Peruvian archaeological record. This study is a contribution not only to the knowledge of non-ritual violence in the pre-Hispanic and Early Colonial Peruvian central coast and its changes through time, but it also provides new interpretive models for the analysis of trauma that will inform future bioarchaeological investigations. Finally, the long term and social complexity perspective of this dissertation will enrich the anthropological debate around violence, providing a better understanding on how violence unfolds in different cultures and different situations within cultures.

Chapter 2

2 Literature Review: The Study of Violence

Social sciences and humanities scholars interested in the study of violence have defined this phenomenon in different ways. Simply put, violence is an unapproved or illegitimate behaviour that harms someone (Eller 2010; Riches 1986). However, the simplification of the word also makes its definition more complicated, because there is no unique answer for what qualifies as violence, as the action can be differently assessed by the victim, the performer, and the witnesses (Eller 2006; Riches 1986, 1991)[2]. In this way, violence can also be more a judgment than an act (Riches 1991), as it "is not only varied but variably valued" (Eller 2010:15). For example, disregard for the safety and well-being of a marginalized group by their dominators could also be considered "violence", while what is considered a "violent action" could differ among different human groups (Walker 2001:575). For that reason, Whitehead (2004a) claimed that the definition of "violence" is not as important as the definition of "violent acts", stressing that the presumption that those acts share some typological characteristics is part of what has hindered attempts to reach a consensual definition of violence.

Although it is common to link violence with just the direct use of physical aggression, it can refer to both physical and non-physical actions, and it can be impulsive (as a result of an emotion-driven response) or instrumental (as a result of a deliberate strategy to obtain something) (James 2011). The strategic dimension of violence has also been mentioned by Riches (1986:26), who stated that "violence may be said to amount to a strategy which is basic to the experience of social interaction." Other researchers have argued that

[2] It is also important to distinguish between "aggression" and "violence". From a social psychological perspective "*aggression* is defined as behaviour performed by one person (i.e., an aggressor) with the intent of physically or psychologically harming another person who wants to avoid the harm (i.e., a victim), and *violence* is defined as an extreme, especially destructive, and cruel form of aggression" (Shaver and Mikulincer 2011:3). On the other hand, anthropologist David Riches (1991) defined "aggression" as the potentiality, or inner tendency to violence. According to Martin and Harrod (2015:116) the term "aggression" should be limited to animal studies "and does not imply a connection to culture or to meaning". Only the term violence is used in this dissertation.

violence has a dialectical nature, being both imagined and performed (e.g. Schröder and Schmidt 2001)[3]; while others have stressed the importance of the concept of social inequality in understanding it. For example, Gil (1986:124) stated that “violence [...] is rooted in socially evolved and institutionalized inequalities of status, rights and power among individuals, sexes, ages, classes, races, and peoples”. In this way, violence has also been described as a “power relationship aimed at subjecting or constraining another person” (Muchembled 2012:7), and as “an instrumentally rational strategy of bargaining for power … [and] a form of symbolic action that conveys cultural meanings, most importantly ideas of legitimacy” (Schröder and Schmidt 2001:8). As Martin and Harrod (2015:116) summarized, “definitions of violence often imply intentionality, motivation, and culturally defined meaning”.

In anthropology, there is a debate as to whether violence is biologically innate or culturally constructed (“the nature vs. nurture debate”). Some scholars have linked human violence and aggression to basic instincts of predatory or defensive behaviour when facing threats (especially regarding the defence of the territory or community), the promotion of intergroup dominance, and even male aggression of females that can be comparable to those exhibited by animals, especially non-human primates (e.g. Ardrey 1967; Crofoot and Wrangham 2010; Honess and Marin 2006; Lorenz 1966; and Smuts and Smuts 1993). Nevertheless, according to some psychologists, psychoanalysts and ethonologists such as Sigmund Freud, Erich Fromm, Boris Cyrulnik, and Daniel Sibony, humans show specific kinds of aggression (Muchembled 2012:10). Other researchers emphasize (albeit in different degrees) the role of socio-cultural and ecological context in shaping violence (e.g. Carman 1997; Fry 2013; James 2011; Malinowski 1941; Martin and Harrod 2015; Muchembled 2012; Parker Pearson 2005; Riches 1986; Schmidt and Schröder 2001; Thorpe 2005; Walker 2001; and Whitehead 2004b).

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[3] According to the authors, the audience gives meaning to violence, because “violent acts are efficient because of their staging of power and legitimacy, probably even more so than due to their actual physical results” (Schröder and Schmidt 2001:6).

The study of violence has captivated the interest of many generations of researchers from different backgrounds, such as history, sociology, anthropology, psychology, medicine, biology, and neuroscience; each of them contributing their unique perspective and methodology to the understanding of this phenomenon.

This dissertation focuses on evidence that bioarcheology can offer to the research of physical violence in the context of conflicts within or between groups. Manifestations of ritual violence (e.g. human sacrifice, cannibalism, trophy taking, head-hunting, torture of captives, etc.) are not considered (although they are mentioned) in this research.

2.1 Bioarchaeology and Violence

Questions regarding the nature and impact of violence in the past vary from the evidence of isolated cases of interpersonal violence to large-scale conflicts. Ritual violence, small scale fighting, raiding, war and warfare, family violence, and male coalitional fighting are some of the forms in which physical violence is expressed. Traditionally, bioarchaeology has centered on violence-related trauma[4] (the most direct and evident sign of physical violence), albeit more recent investigations are exploring other manifestations of violence, such as the manipulation and display of the corpses to make a psychological and political impact on a population (e.g. Pérez 2012), health differences as a reflection of structural violence[5] (e.g. Klaus 2012), and body modification as a form of female oppression (e.g. Stone 2012).

The reconstruction of the behavioural implications of injuries is a two-stage process: 1) Consideration of the most direct and proximate cause of the injury (mechanism) through the analysis of the characteristics and patterns of the lesions; and 2) Reconstruction of the

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[4] Martin and Harrod (2015:120-121) defined violence-related trauma as "injuries caused by interpersonal conflict such as being hit during a face-to-face combat or as a result of household disputes and intergroup animosity and conflict (i.e. feuds and raiding)".

[5] Structural violence includes all the long-standing and multigenerational institutions that legitimize (and sanction) certain kinds of behaviours that create social, political, and economic inequalities. These inequalities are biologically expressed in traumatic injuries, malnutrition, and disease. Although it is often considered a subtle variation of violence, some forms of social control applied by institutions or activities can also produce violent trauma (Klaus 2012; Martin and Harrod 2015; and Martin et al. 2013).

cultural context of the injury ("ultimate cause"), considering both intrinsic and extrinsic factors such as the age, sex, and health status of the victim and the physical and socio-cultural context (Lovell 1997, 2008; Walker 2001). Recently, Martin and Harrod (2015) proposed that a bioarchaeological approach to violence should consider three levels: 1) Data extracted from the skeletal remains; 2) Analysis of contextual data (culture and environment); and 3) Social theory based on ethnography that allows one to formulate and test hypotheses.

2.1.1 Methodology

In the assessment of violence in a past population, the most direct way is to look for any evidence of trauma in the human remains. Fractures are the most obvious paleopathological condition that is related to trauma. However, trauma can also result in some other anomalies such as dislocations and periosteal new bone formation (PNBF) (Aufderheide and Rodríguez-Martín 1998; Buikstra and Ubelaker 1994; Ortner 2003; Waldron 2009; White et al. 2012).

Methodologies in the analysis of fractures in bioarchaeology have become more detailed throughout time, especially due to the influence that forensic anthropology has had on this topic (e.g. Berryman and Symes 1998; Davidson et al. 2011; Galloway 1999; Kimmerle and Baraybar 2008; Klepinger 2006; Komar and Buikstra 2008; Maples 1986; Sauer 1998; and Wedel and Galloway 2014). Besides the gross examination of a bone, there are some complementary analyses such as plain film X-rays and computed tomography (CT) scans that should be considered. They are necessary, for example, in cases of mummified bodies, where the presence of soft tissue makes direct observation of bone impossible[6]. For Mays (2008:80), X-rays are useful because they are a direct link

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[6] However, there seem to be two opposite positions about the role that X-rays can play in the analysis of trauma. For example, Mays (2008:82-86) said that although X-rays are very important in the interpretation of some conditions (e.g. osteoporosis and Harris lines); it is not that important in others (e.g. osteoarthritis, leprosy, and scurvy), making their relevance in the study of skeletal trauma even more limited because antemortem fractures are generally obvious to the naked eye. He also noted that in unclear cases where remodeling is advanced (generally in old healed fractures), it is not generally possible to distinguish a fracture line on X-ray either (Mays 2008:87). On the other hand, there are people who strongly disagree, saying that X-rays can provide important information of the direction of the force, extent of the injury, etc.,

between the changes in paleopathological specimens and modern individuals with known diseases. Despite the increase of the use of CT scans, X-rays are still of great value in paleopathological analysis because there is a large published corpus of cases of diseases without modern treatment, which could be similar to those found in ancient remains. However, although X-rays are cheaper and more available than CT scans, their two dimensional nature and low contrast resolution makes it very difficult to distinguish between different soft-tissue remains, especially when they are superimposed (Lynnerup 2008:103), which is also true for hard-tissue. Other techniques that are also employed in trauma analysis include micro CT, histological analysis, and microscopic analysis.

Scholars choose different strategies when exploring traumatic conditions related to violence in a bioarchaeological investigation, which are generally related to the different hypotheses from where the research starts. Methodologies are strongly influenced by the investigator's question; for example, violence can be studied through the initial assessment (and the posterior explanation) of the presence of interpersonal conflict evidence in a population (e.g. Baraybar 2009; Barreto 2011; Djurić et al. 2006; Meyer et al. 2009; Molto 2015; Salter-Pedersen 2011a; Standen and Arriaza 2000; and Vega 2015a), or to answer more specific questions about the nature of violence, such as how a specific stressful socio-cultural event can be reflected through a rise of violent actions (e.g. Andrushko 2007; Andrushko et al. 2006; Boza 2010; Kellner 2002; Murphy 2004; Salter-Pedersen 2011a; and Tung 2003, 2007, 2012b). However, despite these particularities, most investigations share some common variables, such as trauma timing (antemortem/healed or perimortem/non-healed trauma), number and location of the injury, characteristics and measurements of the fractures, mechanism and causative weapon, and age and sex of the individuals (cohorts) (e.g. Djurić et al. 2006; Gordón and

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which could be hidden by the new bone formation, as is the case of radiologist Greg Garvin. Garvin also thinks than in the case of subadults, X-rays can help to determine if the periosteal deposition of new bone is pathological or not, since normal periosteal deposition usually is shown as a single layer of bone, while pathological conditions can produce many layers, one over the other (Greg Garvin, personal communication 2010).

Ghidini 2007; Lambert 1997; Lovell 1997, 2008; Lund 2009; Meyer et al. 2009; Molto 2015; Murphy 2004; Scott and Buckley 2010; Standen and Arriaza 2000; Standen et al. 2009, 2010; Torres-Rouff and Costa 2006; Tung 2003; and Walker 1989, 2001). Other variables considered by some researchers include related complications of the injury (e.g. Djurić et al. 2006; Lovell 2008; Meyer et al. 2009 and Murphy 2004); severity of the trauma (e.g. Andrushko 2007; and Lund 2009); lethal potentiality of the lesion (e.g. Lambert 1997; Lund 2009; Standen and Arriaza 2000; Standen et al. 2009, 2010; Torres-Rouff and Costa 2006; and Walker 1989); and other pathological conditions that can say something about the ability to escape from violence, such as articular dislocations, partially healed trauma and congenital deformations (e.g. Milner 1995; and Milner et al. 1991).

2.1.1.1 Trauma Timing

The timing of a traumatic event can be estimated by the observation of certain characteristics that appear in the bone after a breakage occurs.

Based on timing, there are three possible types of trauma a) Antemortem trauma (produced before the death, easily distinguished by the visible bone remodeling or healing), b) Perimortem trauma (produced at or around the time of death, which sometimes can be directly associated to the cause of death)[7], and c) Postmortem trauma (lesions that follow death, related to taphonomic events) (Galloway et al. 2014a; Kimmerly and Baraybar 2008; Klepinger 2006; Maples 1986; Sauer 1998; Ubelaker and Montaperto 2014).

Multiple combined factors (i.e. location, severity, and treatment of the injury and age, health status, and genetics of the victim) make the healing process very variable (Galloway et al. 2014a:47-48; Sauer 1998:322), and therefore, the estimation of the time after the injury is a very difficult task. Based on the compilation of data from different

[7] Galloway and Zephro (2004) redefined the perimortem interval as the variable time span between the moment prior to the appearance of the visible signs of healing and the time after the death in which the bone loses enough moisture to change its physical properties.

authors, Maat (2008:Table 5.8) presented an approximate timetable of natural fracture healing without surgical intervention in adults (Table 2.1).

Table 2.1: Healing Phases for Natural Fracture Healing Without Surgical Intervention in Adults (Modified from Maat 2008:Table 5.8)

Healing Phase	**Time**
Hemorrhage and torn periosteum	Immediate-48 hours after injury
Cell debris phagocytosis	In 2-5 days
Newly formed cartilage and osteoid	After 3-5 days
Loss of fracture line definition	After 4-7 days
Well-developed new bone spicules and cartilage	After 7 days
Start of osteoid mineralization	After 10-12 days
Woven bone	After 12-20 days
Osseous procallus (primary callus)	After 14-21 days
Bridging	After 3-4 weeks
Periosteal reaction incorporation	After 6 weeks
Osseous hard callus (secondary callus)	After 2-3 months
Perfect reconstruction	After 1-2 years
Pseudoarthrosis	After 6-9 months

*Timing should be substantially reduced if this timetable is applied in children.

Other problems related to the assessment of timing of the fracture include the difficulty of distinguishing between perimortem trauma (and antemortem trauma that was produced very close to the death) and taphonomic damage, due the lack of remodeling in these kinds of fractures (Larsen 1997:110; Sauer 1998:322-324; Walker 1997:147)[8] and the ambiguous criteria used by different anthropologists (see the discussion in Galloway et al. 2014a:). The most widely accepted criteria for distinguishing perimortem and post-mortem/taphonomic damage are summarized in Table 2.2.

Table 2.2: Most Accepted Criteria for Differentiating Perimortem and Postmortem Fractures (Based on Galloway et al. 2014a; Kimmerle and Baraybar 2008; Maples 1986; Sauers 1998)

Perimortem Trauma	Postmortem Damage
Uneven, irregular edges	Straight and sharp edges
Radiating or concentric (hoop) fractures (sometimes along with bent or warped bone)	No radiating or concentric fractures, or bending
Angled and jagged broken ends	Fractures at right angles to their long axes, flat broken surface
Fracture surfaces stained as the rest of the bone surface*	Fracture surfaces differ in color with the rest of the exposed bone surface*

*To differentiate recent excavation or post-decomposition damage from older fractures (including old postmortem breakage)

2.1.1.2 Number and Location of the Injury

Location of the injury can give information about the handedness of the perpetrator, if the blow was given from behind, if it was a face to face encounter, etc. However, the most common inference made in bioarchaeology is to link the location of the fracture to its cause. For example, “parry fractures” (located in the distal ulnar shaft) frequently occur when a victim raises their forearm to stop a blow to the head. This interpretation has been

[8] The loss of moisture and the degradation of the collagen fibers of the bone produce a dry and less flexible bone. A “dry” bone reacts differently to a breakage than a “wet” bone, making it possible to distinguish between perimortem trauma than occurred very close to the time of death and a breakage that was produced some time after the death occurred (Galloway et al. 2014a).

used almost as an “unequivocal sign of violence”, despite the fact that the same type of injuries can be produced by also by accidental or occupational trauma (Judd 2008; Lovell 1997:161; Walker 2001:582).

Lesions on the skull are considered the violence-related injuries *par excellence* (e.g. Lovell 1997, 2008; Molto 2015; and Walker 1989). However, skull trauma (especially those located in the face) can be related both to intentional and accidental events (see Galloway and Wedel 2014a). Based on recent investigations (e.g. Brink 2009; Brink et al. 1998; Guyomarchc’h et al. 2010; Hussain et al. 1994; Kremer et al. 2008; and Lee et al. 2007), Martin and Harrod (2015:121) recommended separating trauma present above the “hat brim line” and multiple traumatic lesions to the head from those of the facial area; only ascribing depressed fractures on the head to violence, although they also acknowledged that depressions could also result from pathological conditions.

One characteristic of many bioarchaeological investigations about trauma is that they tend to isolate each fracture and treat it as a single unit of analysis. Some of these studies limit their results to percentage of cranial vs. infra-cranial (“post-cranial”) fractures, while others provide more detailed locations (e.g. vault of the skull and upper limbs) (e.g. Andrushko 2007; Djurić et al. 2006; Molto 2015; Scott and Buckley 2010; Standen and Arriaza 2000; and Tung 2003). Assuming beforehand the cause of some kind of fracture (for example, matching skull fractures to violence, or fractures to hand phalanges to accidents) they then use these units to test their hypotheses. There are also many cases where only skulls are studied (e.g. Gordón and Ghidini 2007; Torres-Rouff and Costa 2006; and Walker 1989). This is usually related to the fact that many of the samples are commingled remains or incomplete skeletons (both from excavations and museum collections), which influence the selection of the methodology. However, the observation of the entire skeleton is recommended to support or refute the link of trauma to violence (Larsen 1997; Martin and Harrod 2015). Avoiding the use of the entire skeleton to estimate the cause of the injuries could lead to misinterpretation, as was noted for example, by Meyer and colleagues (2009), who were able to associate hand fractures (usually related to accidents) to other violence-related fractures elsewhere in the skeleton.

The number of fractures (combined with trauma timing) could tell if the individual suffered from repetitive events of trauma during their life.

2.1.1.3 Characteristics of the Fractures

Besides their timing, fractures can also be classified by two main criteria: morphology and biomechanical processes (Galloway et al. 2014b). Morphologically, they can be incomplete (also known as “infractions” in which some continuity between the sections of the fractured bone is retained, more commonly found in children) or complete (which results in the separation of the bone in two or more fragments)[9] (Figure 2.1).

According to its biomechanical process, trauma can be direct (localized to the point of impact) or indirect (located beyond the site of immediate impact)[10]. Galloway and Wedel (2014a:137-140) provided a classification for cranial vault fractures, which can be linear (70-80% of all cranial fractures, usually resulting from direct or indirect forces of relatively large masses, more often found in children), diastatic (which follows the suture, causing separation), depressed (localized at and around areas of impact, with or without penetration), stellate fractures (multiple radiating linear fractures resulting from bending in the cranial vault, possibly related with depressed fractures), and comminuted fractures (result from low-velocity/heavy impact forces that produce fragmentation of the bone) (Figure 2.2).

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[9] Incomplete fractures include bone bruises, bow fractures or plastic deformation, Toddler’s fractures, buckling fractures, greenstick fractures, vertical fractures, and depressed fractures). Complete fractures include transverse, oblique, spiral, comminuted, butterfly, and segmental fractures.

[10] Direct trauma can present in the form of tapping fractures (when a small force is applied to a relatively small area of the body) or crush fractures (resulting when a large force is applied to a large area of the body). Indirect trauma can be linear, avulsion, traction/tension, angulation, rotational, or compression fractures.

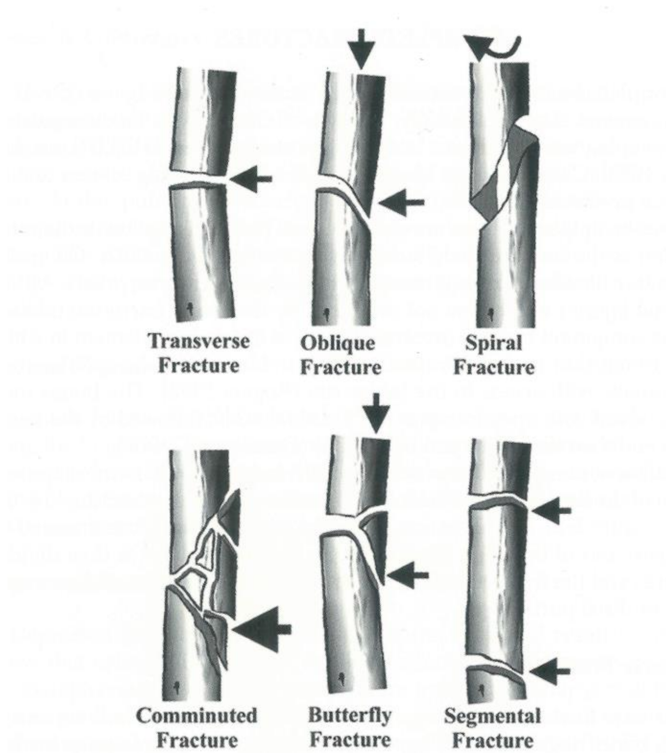

Figure 2.1: Classification of Complete Fractures (Galloway et al. 2014b:Figure 5-2)

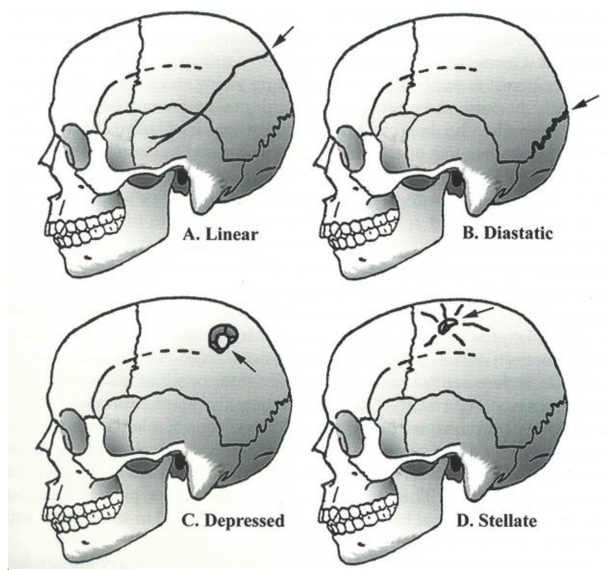

Figure 2.2: Classification of Cranial Vault Fractures

(Galloway and Wedel 2014a:Figure 8-2)

2.1.1.4 Mechanism and Causative Weapon

Another way to classify the fractures is according the mechanism (i.e. blunt force trauma, sharp force trauma, and gunfire injuries)[11] and the weapons that caused them. This is probably one of the most difficult tasks in the assessment of injuries, especially in antemortem fractures. The way in which the skeleton is affected by these mechanisms depends on diverse factors, including characteristics of the affected bone and surrounding tissues, characteristics of the weapon, amount of the applied force, age, weight and health of the victim, location and intention of the perpetrator, etc. (see for example, Kimmerle and Baraybar 2008 and Wedel and Galloway 2014). The principal criteria for distinguishing between the aforementioned types of trauma are summarized in Table 2.3.

Taphonomic changes can also be a problem (especially for an unexperienced investigator or in poorly preserved remains) for the analyst. For example, scratches produced naturally or during excavation could be confused with cut marks (Larsen 1997; Martin and Harrod 2015; Milner et al. 2000; Smith, 1997).

2.1.1.5 Age and Sex of the Individuals (Cohorts)

The reconstruction of the age and sex ("the demographic profile") of the individuals helps to establish how violence affected specific sex and age segments (e.g. women and children). Usually males (especially young adults) were the major participants in violent encounters (e.g. Gurdjian 1973; Owsley 1994; Robb 1997; Verano 1986, 2007; and Walker 1989). However, there are also some cases where the peak of violence related fractures are found among other cohorts, that can be explained, for example of the non-possibility of escape of the injured or deformed, or an ambush of a settlement while the

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[11] Blunt force trauma (BFT) was defined as an injury resulting from a broad instrument (Kimmerle and Baraybar 2008:151) that "may be inflicted under a variety of circumstances and a wide variety of objects, including the human body (kicks, punches)" (Galloway et al. 2014a:56). Sharp Force Trauma (SFT) is an injury produced by an object that is pointed or edged, which can puncture, cut, chop, saw or crush the victim (Kimmerle and Baraybar 2008:265). Gunshot wounds (GSW), gunfire injuries or high-velocity projectile trauma "occurs when a small, hard projectile that travels at a very high rate of speed penetrates the bone" (Galloway et al. 2014a:55). Generally, GSW refers to injuries produced by handguns, rifles, shotguns, submachines, or machine guns (DiMaio 1993). Blast injuries are not considered in the present study.

fighters where gone (e.g. Bennike 1985; Bridges 1996; Lambert 1997; Lambert and Walker 1991; Milner 1995; Milner et al. 1991; Owsley et al. 1991, 1994; Walker 1989; Walker and Lambert 1989; Walker et al. 1989; Webb 1995; and Wilkinson and Van Wagenen 1993).

Table 2.3: Principal Criteria for Differentiating Lesional Mechanisms (Modified from Galloway et al. 2014a:Table 4-1. Based on Berryman and Symes 1998; Galloway 1999; Galloway et al. 2014a; Kimmerle and Baraybar 2008; and Klepinger 2006)

Type of Trauma	Blunt Force Trauma (BFT)	Gunshot Wound (GSW)	Sharp Force Trauma (SFT)
Depressed fractures	Yes	No	No
Plastic Deformation	Yes	No	No
Knapping	Yes	No	No
External/Internal Beveling	No	Yes	No
Presence of Metals	No	Yes	No
Fragmentation	Low	High	Low
V-shaped cuts, shaved defects, point insertions, slot fractures, chop marks, or scoop defects	No	No	Yes

2.1.1.6 Statistical Considerations

The objective of analytical methods in epidemiology is to test a hypothesis (the "null hypothesis"). A null hypothesis (H_0) is a general statement that there is no relationship between two phenomena. It is generally set in opposition to an alternative hypothesis (which represents an explanation of the relationship between the two phenomena at hand. If the null hypothesis is rejected, a new explanation should be provided. If a true null hypothesis is not rejected, it leads to a false positive ("type I error") or false negative ("type II error"). A test of significance (p-value) expresses the degree of confidence with which a null hypothesis can be rejected (the lower the value, the more confident we are that we are not making a type I error) (Waldron 1994).

It must be questioned whether the sample is large enough for statistical validity, as small samples limit the inference of conflict behaviour (Larsen 1997:119-120; Lovell 2008:341). Descriptive statistics such as the frequency and prevalence of each kind of traumatic lesion must therefore be presented (e.g. Djurić et al. 2006; Lovell 2008; and Waldron 2009).

Many researchers seek to establish if the differences in the pattern of fractures that were found are statistically significant or not, using inferential statistics such as Student's t-test; Fisher's exact test, Pearson's chi square, and the odds ratio (e.g. Andrushko 2007; Djurić et al. 2006; Klaus 2014; Lovell 2008; Murphy 2004; Scott and Buckley 2010; Torres-Rouff and Costa 2006; Tung 2003; and Walker 1989) to evaluate the correspondence between the distributions of two or more populations (or subsamples) and to determine if a null hypothesis could be rejected. Generally, a p-value less that 0.05 is considered sufficient to reject a null hypothesis.

2.1.2 Interpreting Violence

A careful reading of the clinical and forensic literature, as well as a complete assessment of the skeleton as a whole should be done before any inference is made with regard to any given skeletal lesion. According to Walker, it is important to consider the forms of modern interpersonal violence which act as a baseline to help us in the interpretation of violence in the past. In addition, this information allows us to distinguish between accidental vs. intentional injuries, keeping in mind that cultural factors can determine weapon choice and pattern of injuries (Walker 2001:581-582). For special kinds of interpersonal violence (e.g. child abuse and spousal abuse), the differential diagnosis must be presented in order to differentiate the injuries from other lesions with similar characteristics.

Walker recommended being conservative in the assessment of an injury as violent. In his opinion, only the obvious injuries (in his own words, "the presence of several arrow points embedded in the skeleton of a man in a mass grave with other injured young men whose skulls show cut marks consistent with scalping") should be considered as violent, leaving the others as accidental (Walker 2001:576). However, as Martin and Harrod recently argued, every potential traumatic lesion should be evaluated in context and multiple interpretations should be considered (Martin and Harrod 2015:121). A population pattern that is consistent with violent encounters documented clinically and ethnographically is considered strong enough evidence to support conclusions about the presence and form of violence in past societies.

2.1.2.1 The Contextual Data

The analysis of the skeleton and its comparison to clinical and forensic data gives the first clues to understand violence in the past. However, in order to gain a full understanding of violence, it is very important to reconstruct the context in which these lesions occurred. Despite some claims that skeletal injuries are the only direct evidence of conflict events in the past (e.g. Harrod et al. 2012; Larsen 1997; Martin et al. 2012b), there are other lines of evidence that cannot be dismissed. These include archaeological evidence for settlement patterns (location of sites in strategic places for defense or military control), defensive architecture (e.g. Stodder and Martin 1992), weaponry (e.g. Lund 2009; and Murphy et al. 2010), and iconography (e.g. Pijoan and Mansilla 1997; and Verano 1986, 2001b). The presence of this kind of archaeological evidence is not unquestionable proof that violent events did occur. However, it gives clues that the threat of conflict was present. In the same way, the lack of evidence could correspond to a truly peaceful reality or to one only in appearance (James 2011:128). Nevertheless, as Layton (2011:164) stated, in spite of the ambiguity of some archaeological evidence, if the limitations of such evidence are accepted, archaeology can throw light on the dynamics of conflict in past societies.

A more direct link between archaeology and violence could be the interpretation of the specific archaeological context in which the bodies were found; for example, projectiles found in direct contact with the skeletons (e.g. Owsley et al. 1994; and Powell and

Rogers 1980), the number of bodies buried simultaneously in a single pit (e.g. Cabrera 1994; Milner and Smith 1989; Standen et al. 2009, 2010; and Verano 2001a), position of the bodies (e.g. Standen et al. 2009, 2010; and Sugiyama 1989), postmortem neglect (i.e. the abandoned of the body on floors, roofs, or ground surfaces) (Kuckelman 2012), and taphonomic changes that can add information about the time between the event and the disposal of the remains (e.g. Milner and Smith 1989; and Standen et al. 2009, 2010). The reconstruction of funerary patterns helps in distinguishing murder and homicide from conventional mortuary behaviour (Martin and Harrod 2015:124). Individuals with perimortem trauma placed in special contexts could be related to human sacrifices, captives, slaves, or receivers of punishment (Fibiger 2014). In addition, associated material can shed some light on the identity of the victims (e.g. Cabrera 1994; Sugiyama 1989; and Verano 2001a) and can be complemented later with other studies such as metric and non-metric traits, DNA, and isotopic analysis to obtain information about the ethnic and geographic origin of the individuals (e.g. Shimada et al. 2005; Sutter and Verano 2007; and White et al. 2002).

Other sources of evidence to explore for evidence of patterns of violence include historical, ethnohistoric and ethnographic materials (e.g. Anderson 2014; Carneiro 1990; Djurić et al. 2006; Ember and Ember 1997; Fowler 1984; Gordón and Ghidini 2007; Haas and Creamer 1993; Harrod et al. 2012; Milner 1995; Milner et al. 1991; Molto 2015; Pijoan and Mansilla 1997; Scott and Buckley 2010; Standen and Arriaza 2000; Torres-Rouff and Costa 2006; Verano 1995, 2001a, 2007; Walker 1989; Wheeler et al. 2007; and Wilkinson and Van Wagenen 1993). Despite the fact that these kinds of data have interpretative problems, they can give insights as to the presence and ways of violence in a specific society (e.g. records of particular conflicts, biological profile of the victims, preferred attack area of the body, and weapon technology). In the case of ethnohistoric records, it is important not to extrapolate this data to other populations which are not related in time or space to that from which the information has been taken[12]. However, the presence of a certain form of violence in a given society opens the possibility that it was also present in a nearby group or in a proximate time period.

2.1.2.2 Patterns of Violence

Violence has been broadly explored by bioarchaeologists in different regions, environments, and types of societies. This research has demonstrated that there is no simplistic link between a certain type of environment/society and the presence or absence of a particular form of violence. In this way, although some studies posit a direct link between violence and climatic instability (i.e. long-term shifts in precipitation and extreme temperatures) and environmental degradation (related to changes in the population density and the scarcity of resources) (e.g. Arkush 2008; Carneiro 1970; Covey 2008; Ember and Ember 1997; Jones et al. 1999; Lambert 1997; LeBlanc 1999; Molto 2015; Standen et al. 2009, 2010; Torres-Rouff and Costa 2006; Walker 1989, 1997; Zhang et al. 2007), there are also cases in which climate change and resource stress did not lead to violence (e.g. Tol and Wagner 2010; Wossink 2009). Similarly, the idea that in small-scale societies cooperation prevails over violence in problem resolution and that warfare appears only in sedentary agriculture-based societies with political centralization (and a territory with resources) (Ferguson 1997, 2011; Fuentes 2004, 2013; Mead 1937) has been challenged by studies such as Lambert (2002), Guilaine and Zammit (2005), Clastres (2010), Kelly (2013), Molto (2015), and Mirazón Lahr and colleagues (2016) who stated that warfare could be present in uncentralized nomadic and forager groups. In fact, ethnographical records suggest that warfare was more frequent and lethal in pre-state populations than in modern-day societies, and that murder and pillaging still occur in societies traditionally considered to be peaceful (Guilaine and Zammit 2005; Keeley 1996)[13]. Nonetheless, it seems that violence in societies that were

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[12] Following James N. Hill's "Tight Local Analogy Method", the known and unknown side of an analogy should be close together in space and time to enhance the likelihood that our identity is correct (Hill 1994:88).

[13] Keeley (1996) presented mortality rates between ~15 and ~30% in conflicts among different pre-state groups (e.g. Jivaro, Yanomami-Shamatari, Dugum Dani, and Mae Enga), while the rates in modern

adopting agriculture was generally low and not lethal (with cranial fractures usually affecting less than 10% of the adults) (e.g. Blau 2007; Cunha et al. 2007; Domett and Tayles 2007; Doran 2007; Douglas and Pietrusewsky 2007; Papathanasiou 2011; Smith 2014; Smith and Horwitz 2007), representing sporadic episodes of interpersonal conflict (Roksandic 2006). However, higher prevalences of cranial trauma (including perimortem fractures) have been detected in some Mesolithic and Neolithic sites (e.g. Beyneix 2007; Jiménez-Brobeil et al. 2009; Mirazón Lahr et al. 2016; Pechenkina et al. 2007; Roksandic 2004; Tescher-Nicola et al. 1999) indicating that warfare could be temporary and restricted to some areas (Roksandic 2004).

According to Martin and Harrod (2015:124), violence in small-scale societies appears in the form of highly ritualized fighting, raiding for resources and women, and feuds between rival groups. Schulting (2013:31-32) noted that violence and warfare were present in small-scale societies of Europe even before the invention of formal weaponry. Men (and even possibly women) were potential warriors who fought if needed, using tools created for other purposes as weapons. This could have also happened in the central Andes as well, as was seen by Lund and colleagues (2013) when they identified a farming tool embedded in the last cervical vertebrae of an adult male. According to Guilaine and Zammit (2005:21-22), prehistoric warfare involves lower numbers (often involving non-specialist) and unfolds without an elaborate strategic plan, organization, or authority figure; contrasting with the professional and hierarchized armies and highly effective weapons that characterize modern war. However, according to the authors, both types of warfare share some features such as the involvement of adult men as the usual active participants. In fact, young males are usually involved in more (and in more lethal) violent events (both as perpetrators and as victims) than females (e.g. Fry 1998; Walker 1997, 2001).

European warfare (Western European wars on the 17th century and French military encounters of the 19th century) were only 2-3%.

All of these (in appearance) contradictory observations lead to the conclusion that multiple circumstances combine to produce and shape violence (c.f. Ferguson 1997, Harrod and Martin 2015, and Nielsen and Walker 2009). Based on diverse studies that showed the importance of other factors in the appearance of this phenomenon (e.g. Ember and Ember 1992; Raleigh et al. 2008; Salehyan 2008), Harrod and Martin (2014) proposed the “Biocultural Model for Multicausal Pathways to Increased Violence”, which considered the interaction of multiple factors (e.g. environmental degradation, ethnic identity and social fragmentation, inequality, fear of unpredictable shortages, migration, and climate change).

Violence-related injuries or malintent trauma are usually classified as intragroup violence (injuries obtained during fights with rivals, family members, or other members of the same community) or intergroup violence (injuries associated with warfare, raiding, feuding, and ambush; which imply the coalition of males who cooperate in the planning of these activities) (Durrant 2011; Martin and Harrod 2015). As Walker (1997:146) argued “different types of violent behavior produce characteristic patterns of skeletal injuries”. The compilation of data and interpretation presented in the literature allows the elaboration of models to try to identify different manifestations of violence, using the most accepted criteria used by different authors. However, it must be acknowledged that these simplistic models are only an approximation to the most probable cause of the lesions. Some factors (e.g. attacks by different persons coming from different sides, or the movement of the victims as they try to escape from the attack) could produce patterns of lesions that do not conform to the models.

Male Confrontations

Male-male confrontations could take place either in the intragroup or in the intergroup level. Fractures on the anterior aspect of the skull (face and frontal bone) in males are usually interpreted as the result of face-to-face confrontations. These lesions are usually concentrated in the left side, as they were more likely produced by a right-handed perpetrator (e.g. Standen and Arriaza 2000; Torres-Rouff and King 2014; Tung 2012b, 2014a; Walker 1989).

The injuries resulting from this kind of conflict could be either non-lethal or lethal, depending of the intention of the involved persons to kill or not, and the selection of weapons (i.e. bare-hand fights and projectile stones will usually left antemortem fractures, while weaponry such as maces, axes, and swords generally produce death). In general terms, well healed antemortem malintent trauma on the anterior aspect of the skull (sometimes associated to clavicular fractures) is interpreted as the result of physical conflict resolution (see for example, Arkush and Tung 2013:Table 2), while high prevalence of perimortem trauma tends to be related to large-scale conflicts (see warfare description for further details).

War and Warfare[14]

Adult males are the most common segment of the population affected by war and other large-scale conflicts. Data extracted from modern wars showed that the majority of victims are young males, with the head and torso the most affected areas of the body. Prevalence of perimortem cranial trauma range between 12.9% and 86.6% (e.g. Baraybar and Gasior 2006; Loe et al. 2014; Ríos et al. 2014; Schats et al. 2014; and Van de Vijver and Kinnaer 2014). The overall prevalence of perimortem lesions may exceed 75%, depending of the preservation of the remains (e.g. Loe et al. 2014; Van de Vijver and Kinnaer 2014). Casualties and injuries are not the only consequences of wars. Some studies have shown that the rates of domestic abuse (among other types of violence) increase dramatically in war periods, being more common among military (Lutz 2004, 2007; Nordstrom 1996, 1998).

Nevertheless, prevalence and patterns taken from modern contexts should be taken with precaution, since the weapons commonly used in this kind of wars (gunfire and explosives) produce more damage than prehistoric weapons. According to Arkush and

[14] *War* is an armed conflict that is collectively carried out by a group who employ lethal weapons with deadly force, which results in the deaths of others whose killings are envisioned in advance (Kelly 2000:3-4). *Warfare* has been defined as "purposeful violence calculated to advance the ambitions of separate political factions, regardless of who was involved, the regularity of fighting, the number of participants, or specific combat tactics" (Milner 1995:221).

Tung (2013:Table 2), warfare in the past can be seen osteologically by the mix of lethal and sub-lethal trauma in the skull, ribs, hands, and parry fractures. Some examples of studies that observed the presence of war-related trauma are summarized in Table 2.4.

People killed in the battlefields were rarely buried in cemeteries. They were left on or around the battlefield, usually in mass graves, buried simultaneously or not (e.g. Guilaine and Zammit 2005; Knüsel 2014; Loe et al. 2014; Ríos et al. 2014; Schats et al. 2014; and Van de Vijver and Kinnaer 2014). Thus, the estimation of the presence of warfare based only on human and material remains can easily underestimate the number of wars and battles.

Raiding and Female Abduction

According to Arkush and Tung (2013:Table 2), victims of raiding can be adults and subadults of both sexes. Victims present trauma on the posterior part of the vault (probably non-lethal in females, lethal in males). It is possible also that there were fewer females than males in the raided community. Conversely, there would be more females (with foreign females showing sub-lethal trauma) than males in the aggressor community. Harrod and Martin (2014) added that raiding and captivity is also associated with multiple traumatic, re-injury, and other pathological conditions that suggest the presence of social inequality. A summary of some studies that inferred this type of violence can be seen in Table 2.5.

Table 2.4: Examples of Patterns of War-Related Trauma[15]

<table>
<tr><th rowspan="2">Site, Region, and Culture</th><th rowspan="2">Context</th><th rowspan="2">Most Affected Segment of Population</th><th colspan="4">Prevalence of Cranial Trauma</th><th rowspan="2">N° and Location of the Fractures</th><th rowspan="2">Type of Fx/Weapons/ Other malintent lesions</th></tr>
<tr><th>M</th><th>F</th><th>S</th><th>Total</th></tr>
<tr><td rowspan="2">Middle Cumberland Region (Pre-historic Eastern NA (Worne et al. 2012)</td><td rowspan="2">Palisades, low visibility sites (located along water sources)</td><td rowspan="2">Adult males</td><td>13.1%
(32/295)</td><td>4.6 %
(8/227)</td><td rowspan="2">Perim:
1 out of ?

Antem:
0</td><td rowspan="2">5.4%
(47/870)</td><td rowspan="2">Cranial (M: mostly anterior, F: mostly posterior) and infra-cranial Fx.</td><td rowspan="2">Mainly BFT. Others: decapitation, projectile point injuries, SFT (including scalping).</td></tr>
<tr><td colspan="2">Antem: 5.94%
(31/522)</td></tr>
<tr><td>Las Palmas (Prehistoric Pericú, Baja California) (Molto 2015)</td><td>Hunter-gatherer-fishers, mostly secondary burials</td><td>Adult males</td><td>Antem:
58.3%
(21/36)

Perim:
5.6%
(2/36)</td><td>Antem:
26.7%
(4/15)

Perim:
0%
(0/15)</td><td></td><td>Antem:
49.0%
(25/51)

Perim:
3.9%
(2/51)</td><td>Cranial (M: mostly frontal and parietals, F: mostly frontal)</td><td>Mainly BFT. Others: projectile point injuries (males)</td></tr>
<tr><td>Battle of Towton (Yorkshire, England A.D.1461) (Fiorato et al. 2007)</td><td>Mass grave (supine and prone position)</td><td>Adult males</td><td>Perim:
96.4%
(27/28)
Antem:
32.1%
(9/28)</td><td>-</td><td>-</td><td>Perim:
96.4%
(27/28)
Antem:
32.1%
(9/28)</td><td>Mostly anterior and posterior part of the skull. Defensive injuries (forearms and hands)</td><td>BFT and SFT. Some puncture wounds.</td></tr>
</table>

[15] Abbreviations for Tables 2.4 to 2.9. M: Males, F: Females, S: Subadults, Fx: Fracture(s), BFT: Blunt Force trauma, SFT: Sharp Force Trauma, NA: North America, Antem: Antemortem, Perim: Perimortem, MNI: Minimum Number of Individuals, Yrs: Years

Table 2.5: Examples of Patterns of Raiding/Female Abduction-Related Trauma

<table>
<tr><th rowspan="2">Site, Region, and Culture</th><th rowspan="2">Context</th><th rowspan="2">Most Affected Segment of Population</th><th colspan="4">Prevalence of Cranial Trauma</th><th rowspan="2">N° and Location of the Fractures</th><th rowspan="2">Type of Fx/Weapons/ Other malintent lesions</th></tr>
<tr><th>M</th><th>F</th><th>S</th><th>Total</th></tr>
<tr><td rowspan="2">The Riviere aux Vase (Southeastern Michigan, Late Woodland AD 1000-1300) (Wilkinson 1997)</td><td rowspan="2">Cemetery, (individual burials, ossuaries, and isolated crania)</td><td rowspan="2">Adult females</td><td>4.1%* (4/98)</td><td>13.2%* (15/114)</td><td>?</td><td>9.0%* (19/212)</td><td rowspan="2">F: 1 to 5 Fx, concentrated on the anterior and posterior part of the skull.

M: Less and less severe injuries, concentrated in the frontal bone.</td><td rowspan="2">BFT</td></tr>
<tr><td colspan="4">*Minimum frequency (includes non-observable cases)</td></tr>
<tr><td>La Plata (American SW, Pueblo group) (Martin 1997)</td><td>Female in abandoned places, not following the usual pattern. No grave goods.

Males: more variability</td><td>Adult females</td><td>Antem: 23.1% (3/13)</td><td>Antem: 60.0%* (6/10)</td><td>Antem: 6.2% (1/16)</td><td>Antem: 25.6% (10/39)</td><td>F: 1-6 Fx, concentrated on the frontal and occipital.

M: isolated injuries concentrated in the back of the parietals.</td><td>BFT or SFT</td></tr>
<tr><td>Beringa (Wari Empire, Arequipa, Peru) (Tung 2012b; Tung and Owen 2006)</td><td>Peripheral Wari site, largely non-elite burials</td><td>Adults</td><td>50% (5/10)</td><td>31% (4/13)</td><td>3% (1/33)</td><td>Adult total: 33% (13/39)</td><td>F: on the posterior part of the vault.

M: anterior and posterior part of the skull. Parry fractures.</td><td>BFT, mostly antemortem</td></tr>
</table>

Surprise Ambush or Assault

Patterns in victims of surprise ambush or assault have not yet been established. Arkush and Tung (2003:Table 2) grouped this type of violent encounters together with raids and the abduction of women. However, it must be noted that ambush could also occur in situations in which the ultimate goal is not “woman-hunting” but to kill a person or a group of persons (usually men). However, it can be said that this kind of violence appears to affect more males than females, involving multiple perimortem fractures mainly in the head, but other parts of the body can also be injured (see for example Paine et al. 2007 and Standen et al. 2009, 2010).

Massacres

Massacres, defined as “brutal slaughter of a group of people that often includes all ages and both sexes” (Harrod and Martin 2015:129) is usually recognized for its elevated rates of perimortem trauma that affects a large segment of population, usually buried in mass graves (Arkush and Tung 2013:Table 2). Some examples of archaeological massacres are presented in Table 2.6.

Ritual Battles

Ritual battles are violent encounters between two parties that have to follow very specific conventions, allowing winners gained social and economic benefits. In prehistoric societies, ritual wars were a way to limit confrontations and human live losses, minimizing the extension of violence in a society (Guilaine and Zammit 2005:27-29). These battles mostly affect men. Non-lethal head wounds and low prevalence of perimortem injuries have been interpreted as the result of ritualized battles (e.g. Arkush and Tung 2013; Lambert 1997, 2002; Tung 2012b; and Walker 1989, 1997). According to Arkush and Tung (2013:Table 2), rib, hand, and parry fractures can also appear in this kind of battles. Two examples of possible ritual violence in archaeological contexts are shown in Table 2.7.

Table 2.6: Examples of Patterns of Massacre-Related Trauma

Site, Region, and Culture	**Context**	**Most Affected Segment of Population**	**Prevalence of Cranial Trauma**				**N° and Location of the Fractures**	**Type of Fx/Weapons/ Other malintent lesions**
			M	**F**	**S**	**Total**		
Kuelap (Chacha-poya culture, Peru) (Toyne and Narvaez 2014)	Fortified site. Unburied or buried in a single event, varied body positions	Adult males and children	Perimortem: 93.9% (31/33)		Perim: 94.6% (35/37)	Perim: 94.3% (66/70)	Multiple cranial (especially in the L parietal) and infra-cranial Fx, includying parry Fx.	Mainly BFT (star-shaped mace?)
Ofnet (Bavarian Mesolithic) (Frayer 1997)	A cave with two pits containing skulls and some cervical vertebrae.	Adult females and children	Perim: 100% (5/5)	Perim: 30% (3/10)	Perim: 58.8% (10/17)	Perim: 56.3% (18/32)	Right side (front and back of the skull). More number of lesions in males than in females	BFT and SFT (decapitation)
Punta Lobos (Late Intermediate Period, Huarmey, Peru) (Verano 2007; Verano and Toyne 2011)	MNI=178 superficial burials. The majority were facing down, hands and feet tied.	Young males and possibly male juveniles (8-18 yrs)	Perim: 0% (0/91)	-	Perim: 0% (0/47)	Antem: 18.2% (22/121) Perim: 0% (0/138)	-	SFT (neck and upper thorax) Male adults: 65.9% (60/91), Subadults: 36.2% (17/47) Total: 55.8% (77/138)

Table 2.7: Examples of Patterns of Ritual Violence-Related Trauma

Site, Region, and Culture	Context	Most Affected Segment of Population	Prevalence of Cranial Trauma				N° and Location of the Fractures	Type of Fx/Weapons/ Other malintent lesions
			M	F	S	Total		
Santa Barbara Channel (Pre-historic Southern California) (Walker 1989)	Geographical and ecological constrained islanders	Adult males	Antem: 24.3% (75/309)	Antem: 10.2% (36/352)	Antem: 3.7% (1/27)	Adults: Antem: 16.8% (111/661)	Frontal and parietals (no sex differences). Injuries deeper in males than in females.	BFT
La Real (Wari Empire, Arequipa, Peru) (Tung 2012b; Tung and Owen 2006)	Peripheral Wari site, elite individuals	Adult males	Antem: 41% (16/39) Perim: 0% (0/39)	Antem: 19% (5/26) Perim: 0% (0/26)	Antem: 0% (0/16) Perim: 6.3% (1/16)	Adults: Antem: 30.8% (32/104) Perim: 4.8% (5/104)	Single or multiple lesions, mostly AM, especially in the face (males) and back (females)	BFT

Violence against Women

When talking about violence directed at females, one of the first things that we associate it with is domestic abuse, more recently renamed as Intimate Partner Violence – IPV (see for example, Martin and Harrod 2015). Although in many societies the perpetrator of this kind of violence is usually the male partner, aggressors can be also other family members (co-wives, mother in law, etc.) or other members of the community. Martin and Harrod (2015:131) argued that its identification is problematic since we only can rely on the pattern of injuries. Some examples of suspected violence against women are presented in Table 2.8.

Table 2.8: Examples of Suspected Violence against Women

Site, Region, and Culture	Sex, Age, Identity	Description of the lesions
Cochopata (Wari Empire, Ayacucho, Peru) (Tung 2012a)	Middle adult female (47-53 yrs), possibly born in other region and brought to the site by age 3.	Injuries in diverse states of healing (upper and posterior part of the left parietal, and left ribs – especially sternal ends of ribs 4-7) and possible association with antemortem loss of frontal teeth, indicating at least two violent events. More violent injuries than those found in local females.
Huari-Monqachayoq (Late Intermediate Period, Ayacucho, Peru) (Tung 2014a)		Three females exhibiting healed fractures on the left nasal bone, antemortem superior-anterior tooth loss. Two of them also presented traumatic dislocation of the mandible. One of these females presented a healing fracture in a temporal bone.
Huaca Pucllana (Late Lima, Peru) (Barreto 2012)	Middle adult female, (30-40 yrs), victim of sacrifice	Rib fractures in at least three different stages of healing, antemortem fractures in pelvis, right parietal, (and possibly in the left parietal), periosteal reaction around the right orbit and tibias. Perimortem puncture wounds in thorax and pelvis, perimortem BFT to the chests and lower limbs.
Rinconada (Salter-Pedersen 2011a; Salter-Pedersen and Lund 2007	Female. Considerably shorter than other females at the site	Eighteen healed rib fractures in different stages of healing, antemortem trauma to the face, and Colles' fracture to the right forearm. Many indicators of non-specific stress.

Child Abuse

Suspicious cases of child abuse include fractures that are not commonly produced by accidents, given their location and young age of the possible victim (i.e. cranial fractures in infants/children under 2 years old and long bone fractures in infants/children younger than 18 months). Also, proliferative and unorganized periosteal new bone formation can be related to this kind of violence. Even some associated pathologies such as rickets may be a sign of child neglect (Lewis 2007, 2014). Lewis (2014:58) noted that child abuse could be misread from the archaeological record because greenstick fractures in children tend to heal rapidly, leaving no deformities. Equally, periosteal lesions could be confused with infections. Table 2.9 summarizes some of the suspected cases of child abuse found in the bioarchaeological literature.

Table 2.9: Examples of Suspected Child Abuse

Site, Region, and Culture	**Age**	**Description of the lesions / Associated pathologies**
Puruchuco-Huaquerones (Late Horizon-Spanish Conquest, Peru) (Gaither 2012)	0-3 yrs (n=4)	Probably "Likely caregiver-induced violence" : 1) Femoral fracture in a child under 1 year of age, 2) Humeral fracture and bilateral endocranial lesions in a child under 1 year of age, 3) a three-year old with multiple lesions in different stages of healing (long bones, ribs, vertebra), 4) Eight additional individuals younger than 2 years old with bilateral endocranial lesions
Roman Lisieux-Michelet (Normandy, France) (Blondiaux et al. 2002)	2 yrs	Several head injuries and rib fractures. Rickets.
Kellis 2 (Dakhleh Oasis (Ancient Egypt) (Wheeler et al. 2007, 2013)	2-3 yrs	Multiple trauma in various stages of healing and widespread proliferative and unorganized new bone formation affecting humeri, clavicles, ribs, and ilia.
Romano-British Poundbury Camp (Lewis 2010)	18 m	Tibial bucket-handle fracture.
St. Oswald´s Priority (Gloucester, England) (Lewis 2014)	1-2 yrs	Partially healed mid-haft fracture of the right humerus. Rickets.

2.1.2.3 Social Theory

Social theory helps researches move from the descriptive data extracted from bones to interpretations with broader significance to understand the past, allowing one to consider the multiple motivations that caused the lesions (Martin and Harrod 2015; Martin et al. 2013; Smith 2014).

Violence has been studied through the lens of difference theoretical frames, such as the evolutionary perspective. This theory is helpful in studies that focus in the origin and development of human violence, especially in those covering a large time span (Martin et al. 2012b, 2013). Studies based on bio-cultural evolution showed that the origins of violence can be traced back to very ancient times (e.g. Frayer 1997; and Mirazón Lahr 2016), and that “violence is not some unexplained aberrant act but is adaptive in many situations” (Martin et al. 2013:68). Some of these studies for example, suggest that coalitional or collective violence (the origin of other forms of violence such as raiding, ambush, and warfare) is the result of the selective advantage for males inside one group to cooperate to attack males from other groups (see for example Choi and Bowles 2007; Durrant 2011; and LeBlanc 1999).

Ecology based theories are a group of theories (including human ecology, cultural ecology, and human behavioural ecology) which center in the observation of the human cultural and biological adaptation to (and modification of) a particular environment (Martin et al. 2012b, 2013). In this way, many authors (e.g. Carneiro 1970; Harrod and Martin 2014; Jones et al. 1999; Lambert 1997; LeBlanc 1999; and Torres-Rouff and Costa 2006) have suggested a link between escalations of violence and environmental stress.

Another theory has been used to understand violence in the past is the gender approach. This theory helps the bioarchaeologists to go beyond the dichotomy male-female given by the sex estimation methods to reach a better understanding on how genders (shaped by the cultural contexts) faced stress (in this case, violence) in a different manner (e.g. Jurmain and Kilgore 1998; and Tung 2012a, 2014a).

More recently, social theories such as identity and the human body, inequality, and colonization and imperialism are helping to shape our understanding of violence in the past (Martin et al. 2012b, 2013). Theories focused on identity and the human body explore the impact of institutionalized forms of political/gender oppression, structural/cultural violence, and social control and domination of the body, expressed in the form of trauma or diseases that result from violence, inadequate diet, and starvation (e.g. Erdal 2012; Klaus 2012; Martin and Harrod 2015; Osterholtz 2012 ; Scheper-Hughes and Lock 1987; Shuler 2011; Stone 2012; and Watkins 2012) and also the manipulation and display of the dead as a political manifestation of power that can instill fear in a group. (e.g. Pérez 2012).

Theories regarding inequality (including Marxist, economical, and political-economical theories) focus on lived experiences, social relations, and historical contingencies in order to understand the political and economic factors that originate and maintain inequality (e.g. social hierarchies/classes and gender-based differentiations) in human groups (Martin et al. 2013). There are some examples of the use of these theories in bioarchaeological research which examined if people of certain social status (inferred from their funerary treatment) was the target of violence (e.g. Farnum 2002; Martin et al. 2001; Muno 2009-2010; Murphy 2004; and Torres-Rouff and King 2014). Other studies explored how high-status individuals use violence as a means of domination and maintenance of power (e.g. Verano 2014a; and Whitehead 2004a) while others observed the use of violence as a way of obtaining social status (e.g. Harrod 2012: Powell 1991; Tung 2007, 2014b; and Walker 1989).

Imperialism (and colonization) theory is one of the most explored in the Andean region (e.g. Andrushko 2007; Andrushko et al. 2006; Boza 2010; Kellner 2002; Murphy 2004; Murphy et al. 2011; Salter-Pedersen 2011a; and Tung 2007, 2012b). One of the insights gained through this perspective is that the external influence of a stronger state can disrupt relations in the local and supra-local levels, and therefore produce intra-local violence in some cases, as was seen among the Yanomani at the time of Western contact (Ferguson 1992) and possibly in Beringa, in the periphery of the Wari Empire (Tung and Owen 2006).

The collapse/post-collapse theories explore the process in which complex societies (e.g. states and empires) decline and the political hierarchies and leadership dissolve to later re-emerge or transform into other forms of social organization (Kurin 2012; Tainter 1988). Studies based on this perspective have suggested that violence escalates in periods of socio-political instability produced by the collapse of an Empire or other complex societies (e.g. Cahill 2010; Covey 2008; Kurin 2012, 2014; Tainter 1988; and Yoffee 2005).

Socio-political studies have shown that violence can be used as a political tool, in which it is accepted that the state can use sanctioned violence for particular reasons, such as maintaining social order to ensure domination (e.g. Blok 2000; Weber 1998). As a consequence of domination, resistance arises. Violent resistance has often been seen as the natural response to conquest. However, resistance can manifest itself in diverse ways in which concepts such as of agency, negotiation, appropriation, and accommodation interplay (see for example Liebmann and Murphy 2011 and Stein 2005).

2.2 Clinical and Forensic Approaches to Violence

Although clinical and forensic investigations on violence differ in many aspects from bioarchaeological research, they provide useful insights to understand violent behaviours. Clinical medicine and psychological research about violence is focused on the diagnosis, treatment and prevention of violent actions that are considered a health problem (paralleling studying its origins and consequences) paying attention to topics that are related to increased injury morbidity and mortality levels, disability, and poor quality of life (e.g. Baker and Li 2012; and Shaver and Mikulincer 2011). Forensic pathology and anthropology, in the other hand, focus on the identification of the victim and the determination of the cause, manner, and mechanism of death, as well as on collecting evidence that can be used as evidence during a trial (e.g.; DiMaio and Dana 2007; DiMaio and DiMaio 2001; Klepinger 2006; Komar and Buikstra 2008; and Wyatt et al. 2011).

Both clinical and forensic studies are usually case-specific and focus on themes such as family violence (e.g. child abuse, wife beating, and elder abuse), drug and alcohol-related violence, suicide, and other actions that lead to judicial prosecution such as murders, deaths during arrest and in police custody, and sexual assaults (e.g. Ammerman and Hersen 1992; Barhill 1982; Brittain 2006; Brogdon 1998, 2011; Brown and Muscari 2010; DiMaio and Dana 2007; DiMaio and DiMaio 2001; Ludwig et al. 2010; McLay 2009; Mattrox et al. 2013; Shaver and Mikulincer 2011; Smith 2008; South-Paul et al. 2015; Swanson 1993; Thali et al. 2011; and Wyatt et al. 2011). Other topics of interest include the management of battle casualties (e.g. Mattrox et al. 2013), and more recent social issues such as gang violence; human rights abuse and terrorism (e.g. Brogdon

1998; Kimmerle and Baraybar 2008; and Wyatt et al. 2011); human trafficking (Brown and Muscari 2010); and bullying (e.g. Rivers 2011; and Sentenac et al. 2012).

2.2.1 Methodology

Clinical assessment of physical violence starts with an initial evaluation of the victim and the compilation of the patient history, followed by the actual physical examination and complementary laboratory analyses. Imaging techniques are key in the assessment of the injuries (see for example, Mattrox et al. 2013). A forensic pathology examination, on the other hand, follows three major steps (DiMaio and Dana 2007): 1) Investigation of the circumstances of death; 2) Examination of the body, including the use of auxiliary techniques such as conventional X-rays, digital fluoroscopy, ultrasounds, computed tomography (CT scans)[16], and magnetic resonance imaging (MRI) (e.g. Burke 2012; and Thali et al. 2011); and 3) Laboratory tests such as toxicology (e.g. drug screening, and gas chromatography), trace elements, fingerprints, DNA, and psychiatry/psychology (DiMaio and Dana 2007; Wyatt et al. 2011).

Unlike bioarchaeology, clinical and forensic medicine examinations generally have to deal with wounds that can be found mainly in soft tissue, such as lacerations, abrasions, scratches, bruising, fire and thermal injuries, and human bites (e.g. DiMaio and Dana 2007; DiMaio and DiMaio 2001; Mattrox et al. 2013; and Wyatt et al. 2011). In the same way, clinical and forensic methodologies usually follow standardized systems and protocols, such as the International Classification of Diseases (ICD)[17] and the Istanbul Protocol[18].

[16] The use of CT scans to document and display complex fractures in the court room reduces the emotional impact that the images produce in some viewers (e.g. victim's relatives and jury) and makes the injuries more understandable. They are especially useful in difficult forensic cases such as in the analysis of decomposed and burned remains, to distinguish between different kinds of falls (i.e. accidental vs. homicidal), child abuse, and transportation incidents (Burke 2012).

[17] ICD is used to categorize diseases, injuries, and external causes of injuries in a way that allow the compilation and comparison of morbidity and mortality data, producing national and international statistics (McKenzie et al. 2012:4).

[18] The Istanbul Protocol is an international guideline for the investigation of alleged cases of torture, recognized as an official document by the UN.

Despite the fact that clinical studies usually deal with independent victims of violence, epidemiological studies have also been conducted in order to understand population patterns that help in the prevention and diagnosis of violence. Some of them try to link violence with mental illness (e.g. Tardiff 2000) and post-traumatic stress disorders (e.g. Connorton et al. 2012) or alcohol consumption (e.g. Collins and Messerschmidt 1993); or are focused in special topics such as juvenile violence (e.g. Farrington and Loeber 2000), and/or political violence (e.g. Zwi and Ugarte 1989). Many variables found in these studies are used to reconstruct the profile of the abuser and the victim: sex, age, ethnicity, socio-economic status, substance abuse, and mental health. The study design could be cross-sectional or longitudinal, depending on the research question, and the information can be obtained using questionnaires to collect self-reported data, searching in official records or by reviewing previous researches. Recent progress in injury prevention and control is related to the implementation of the Haddon Matrix, a conceptual framework that derives from the epidemiologic triad of agent, host, and environment, dividing them in three phases (pre-event, event, and post-event), that serve as the theoretical basis of epidemiologic approaches to understand causes of injuries and to design control strategies (Baker and Li 2012:1).

2.2.2 Interpretation

Clinical and forensic medicine compare both skeletal and soft tissue injuries that are found on the victim with previously reported cases of violence to corroborate the testimonies of the victim and witnesses or to identify possible cases of maltreatment or other illegal actions that require special measures (e.g. psychological support or legal proceedings) when direct testimonies are not available. For example, a recent epidemiological investigation has demonstrated that the head-neck-face area has a statistically significant association with IPV (Wu et al. 2010). The middle third of the face is the area with the highest risk of being injured in this kind of violence (Fonseka 1974; Le et al. 2001), and the most common fractures associated are complex zygomatic fractures, orbital blow-out fractures, and intracranial injuries (Arosarena et al. 2009), although nasal fractures are also relatively common (Fonseka 1974; Muelleman et al. 1996).

The analysis of the pattern of injuries is complemented with differential diagnoses that are given in order to not confuse injuries produced by violence with other conditions that leave similar characteristics. For example, in cases of injured infants and children, suspected injuries are those “accidentally” discovered during an examination, a fracture more severe than what is expected according to the history, multiple lesions in different parts of the body (including trauma, periosteal reaction and new bone formation) in various stages of healing, especially in upper limbs, followed by skull and posterior part of the ribs without a correlation with the history of the patient (e.g. Brogdon 1998; Galloway 1999; Galloway and Wedel 2014b; Ludwig et al. 2010; Moore and Smith 2006; and Walker et al. 1997). Differential diagnosis for child abuse includes other conditions that leave skeletal involvement such as accidental trauma, osteogenesis imperfecta, scurvy, rickets, Caffey’s disease, birth trauma and infections (e.g. congenital syphilis and osteomyelitis) (e.g. Bilo et al. 2010; Walker et al. 1997; and Wheeler et al. 2007, 2013).

Although clinical data suggest that most victims of interpersonal violence are young males (e.g. Aalund et al. 1990; Hussain et al. 1994; Jennet 1996), epidemiological studies can also lead to the identification of the segments of the population that are more vulnerable to specific kinds of violence, such as children, elderly, and pregnant women (Smith 2008:635). These studies also provide information about the biological and environmental factors that contribute to the development of violent behaviour, the relation between victim and offender, the consequences of violence, and so on.

Data in population analyses are usually presented in the form of prevalence or incidence values, and it is often analyzed using the odds ratio statistic (e.g. Swanson 1993). However, some studies also include multivariate analytical statistics such as Bayesian, ANOVA, and regression analysis (e.g. Cook and Moore 1993; and Tatem et al. 1997). All this information is used to improve preventive social policies (e.g. Alkon et al. 2001; Baker and Li 2012; Dahlberg and Potter 2001; Dodge 2001; Dumas et al. 2001; Eddy et al. 2001; Evans et al. 2001; Ikeda et al. 2001; Mercy and Hammond 2001; and Prinz et al. 2001).

2.3 Bioarchaeological Limitations and Crossovers with Clinical and Forensic Research

In both bioarchaeology and clinical/forensic medicine, the research is designed to obtain data that will address questions about the identity of the victims and perpetrators, the nature of the injuries, and the context in which those injuries where produced. However, while clinical/forensic studies can corroborate the information with official records or by interviewing the victim's relatives (and in the case of clinical studies, by interviewing the victim directly), bioarchaeology is usually confined to the information that can be gathered from the study of the skeletons and the archaeological contexts in which the individuals were found, which limits the interpretations that can be obtained from it. In this way, bioarchaeology deals with data that are not completely reliable, leading to conclusions that can be better described as most probable estimations and scenarios.

In terms of the identification of the individuals involved, both kinds of research collect information about their biological profile (sex, age, ancestry) and social status. However, since in bioarchaeology the remains of the victim are the main source of information, the data that can be obtained are focused principally in the victim rather than in the perpetrator. Bioarchaeological data are also affected by the methodological limitations and assumptions that are involved in this kind of research. For example, age estimations in bioarchaeology rest on methods developed from the evaluation of skeletal development and deterioration which provides a biological age range that may or may not coincide with the actual chronological age at death of the individual. In the same way, sex estimation in subadults based in skeletal assessment is very controversial, thus, these data are usually omitted for these cohorts. Another example is the inference of the gender and/or social status of an individual based on the associations found in the grave. It is usually assumed that these associations reflect the gender and/or social status that an individual had during their life. Nevertheless, this could be not always true, as funerary practices can differ among cultures, especially in victims of death by violence.

In the case of the determination of the cause of the lesions, bioarchaeological and clinical research uses previous clinical studies of well-documented cases of injuries to establish an interpretation that violence has taken place. However, bioarchaeology is usually limited to the assessment of injuries in the skeleton, which can underestimate the prevalence of violence in a population, since injuries from violence do not always leave marks on the bones[19]. Other limitations in bioarchaeological studies arise when trying to extrapolate clinical data to what is found in the archaeological record, since skeletal data in clinical assessments are taken using imaging techniques, while bioarchaeological data is usually obtained by direct observation of the bone (which in addition, is not always in good state of preservation). For example, hair-line fractures and metaphyseal "chips" that are found in clinical cases of child abuse, are not seen in bioarchaeological samples, but PNBFs, that are invisible to X-rays, are easily seen in gross examinations of defleshed skeletons (Lewis 2007:183).

Bioarchaeological research also has the problem of whether the sample studied is representative of the population from which it was drawn, not only because of taphonomic forces that can destroy part of the remains (especially those of juveniles), but also of cultural behaviours that can determine that not all the individuals of the population were buried in the same place. Even recovery techniques can affect the nature of the sample, especially if the skeletons were recovered with non-probabilistic sampling sample techniques. Paleoepidemiological research, in the other hand, also has to deal with conceptual problems such as population non-stationarity, selective mortality, and hidden heterogeneity (Wood et al. 1992). In the case of trauma, since it is a condition whose morbidity progresses with age, the demographic profile of the sample can affect the prevalence values. In consequence, a sample with a larger number of older individuals will tend to show higher rates of trauma prevalence (Glencross 2011; Glencross and Sawchuk 2003). In addition, paleoepidemiology is limited to cross-sectional studies, which do not allow the direct observation of temporal trends or fluctuations through time.

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[19] Based on clinical reports of arrow inflicted lesions in the Indian wars of the American West (19th century), Milner (2005) concluded that the real prevalence of projectile lesions in an archaeological collection could be conservatively estimated in three times the number of individuals with clear signs of arrow lesions. In the same way, a forensic study of de la Grandmaison and colleagues (2001) on modern French cases found that only 90% of 130 persons that died from GSW, exhibited bone damage.

Finally, although clinical and bioarchaeological research obtain data that are used to reconstruct the context of violence, they differ at the level of social interaction that they usually cover. In this way, since the identity of the actors of violence in the past is usually unknown, bioarchaeology research is focused in the reconstruction of “the big picture” or the socio-cultural and political context in which those violent events took place; while clinical investigations are focused in the reconstruction of contexts that are more related to the individual, such as family, school, work, and neighbourhood.

Bioarchaeology can benefit from clinical methodologies such as the use of standardized protocols that can help in the comparison of results from other bioarchaeological studies[20], and the inclusion of exhaustive differential diagnoses that could avoid simplistic deductions (e.g. fracture on the forearm equals defensive lesion equals violence). In addition, clinical studies help bioarchaeologists to see beyond the bone, and realize that a fracture is not only an isolated appearance, but also a lesion that has implications for the soft tissue and the overall health of the individual.

Clinical studies, on the other hand, could learn from the multidisciplinary perspective of bioarchaeological research, and its stress on cultural differences in the shaping of violence, something that has been recently tried in clinical psychology studies about this phenomenon (see for example, Shaver and Mikulincer 2011). Although the variable “ethnicity” is present in clinical studies, it seems that it is more related to a phenotypic classification rather than to true cultural groups. The contribution of social sciences and humanities, for example, can broaden the understanding of modern manifestations of violence and its impact on health in a population level.

[20] Recently, Appleby et al. (2015) have proposed to apply a modified version of the Istanbul Protocol in bioarchaeological research.

Chapter 3

3 Literature Review: Archaeological Background

This chapter is divided into five parts. The first two describe the ecological, historical, and archaeological setting of the Peruvian central coast. These are followed by a summary of the extant evidence for violence found in the Andes throughout the different time periods, and a section presenting the different ways that violence has been recorded bioarchaeologically, archaeologically, ethnohistorically, and ethnographically in the Andean region. Finally, a list of expectations for the prevalence of malintent trauma for each time period is provided.

3.1 Geographical and Ecological Setting

The Peruvian coast is mostly a longitudinal desert interrupted transversally by narrow fluvial valleys and fog oases. It is bordered to the west by the Pacific Ocean and to the east by mountains with an elevation of 500-1000 meters above sea level (the "Coastal Range"[21]) (Brack and Mendiola 2004; Pulgar 1987). The coastal morphology presents a wavy relief, which alternates low hills with fluvial and maritime terraces. Only a few rivers maintain a significant flow throughout the year. During the austral summer, rivers exhibit their maximum water volume, coinciding with the rainy season in the highlands (Peñaherrera 1986).

The geographic area called *central coast* by archaeologists is a narrow region about 40 km wide (Pulgar 1987) which includes the three valleys surrounding Lima, the Peruvian capital: Chillón, Rímac, and Lurín. The former two are among the longest coastal rivers, and they carry larger amounts of water than most (Peñaherrera 1986). However, this geographic/cultural region is sometimes described as comprising a larger area extending from Chanchay to Chilca (Lanning 1967), depending on the level of integration with the core area that those peripheral valleys exhibited during specific periods (Figure 3.1).

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[21] The Coastal Range is a succession of hills (part of the Andean mountain chain) which runs close and parallel to the littoral, (Peñaherrera 1986; Pulgar 1987).

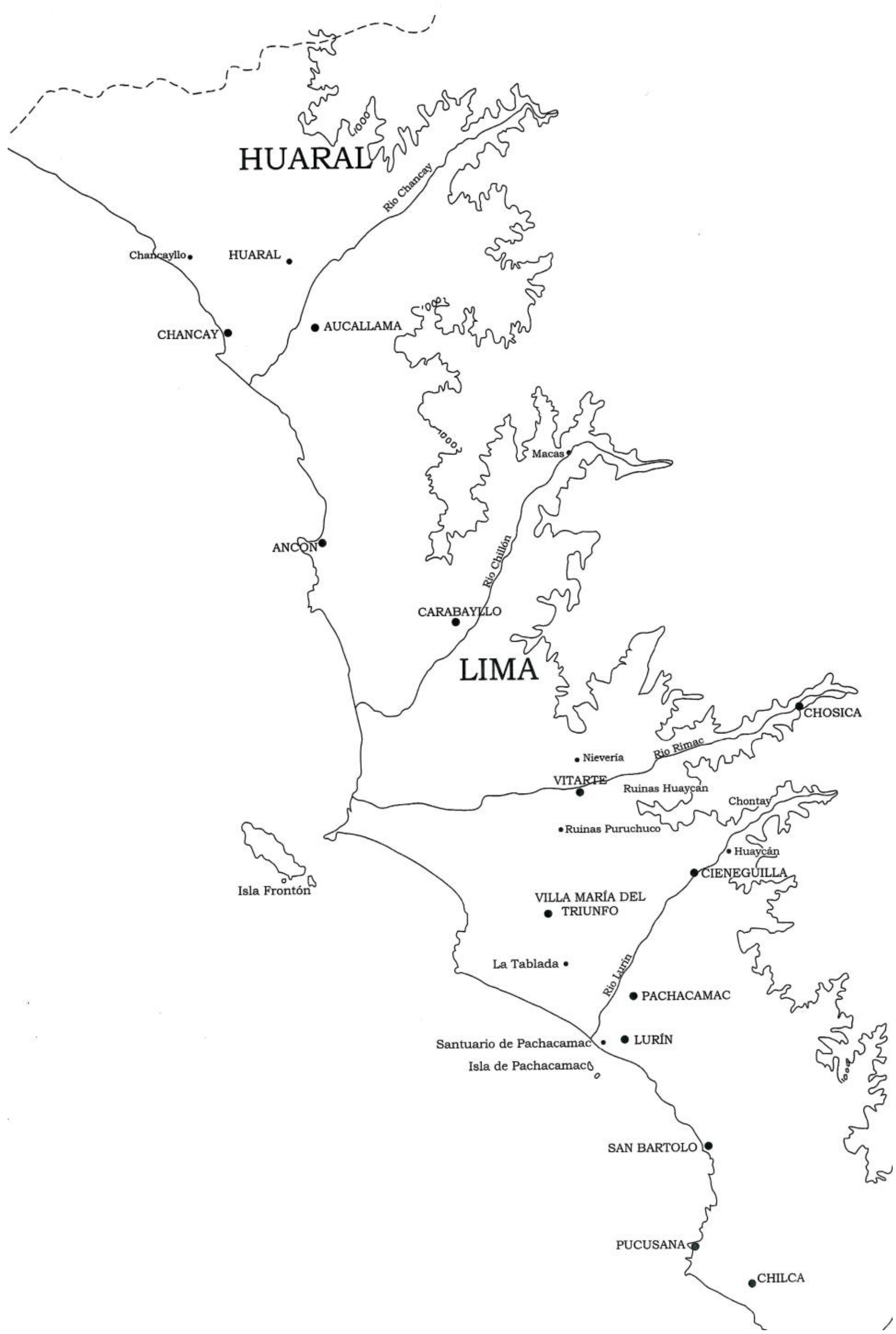

Figure 3.1: Map of the Peruvian Central Coast
(after Marcone and López-Hurtado 2002:Fig. 1)

The Coastal Range in this extended zone almost reaches the seashore (Pulgar 1987). This arid area presents a very high relative humidity, with an annual average of between 84 and 93% (100% during winter). Precipitation events are rare (a mean rainfall of 48 mm in Lima); however, between May and December fogs and drizzles (locally known as *garúa*) can appear. The fog and drizzle produce the *lomas* (fog hills), isolated areas of seasonal vegetation, which flourishes on the hill slopes facing the sea during the winter (May-October) (Brack and Mendiola 2004; Peñaherrera 1986; Pulgar 1987). The occasional presence of the El Niño phenomenon can impact the ecosystem of the area by elevating the sea temperatures, altering the biology of the sea, and increasing the amount of rain on the coast (sometimes associated with inundations) (Brack and Mendiola 2004).

As in the case of other valleys of the central part of Peru, the Chillón, Rímac, and Lurín valleys are classically divided into three main areas: lower, middle, and upper valley. The first two are relevant for the present study and are described below.

Given the amount of potentially cultivatable areas[22], mild weather conditions, the relatively easy transportation of goods and communication between settlements, and the access to the rich littoral, the lower valley is one of the best environments for highly developed dense populations (Dillehay 1976). Although the areas surrounding the lower part of these valleys are mostly desertic today, it seems that this was not the case in the past. Ethnohistoric information gathered by Rostworowski (1981) tells us of the presence of reed beds near Ancón, numerous lagoons and swamps in Callao and Pachacamac, and *huarango* forests in the Rímac and Lurín valleys. These ethnohistoric observations were corroborated by Moutarde’s (2006) anthracologic investigations in some archaeological sites of the Lurín Valley (Figure 3.2). Likewise, it seems that the *lomas* supported a larger variety of faunal and botanic resources, including pastures for camelid herding. The indiscriminate felling of trees for coal and the negative impact of the foreign animals brought by the Spaniards (e.g. horses, cattle, and goats) almost led to the extinction of some species (Rostworowski 1981).

[22] Among the crops that were cultivated in ancient times are lucuma, cotton, gourds, peanuts, corn, beans, yucca, and wild tubers (Dillehay 1976).

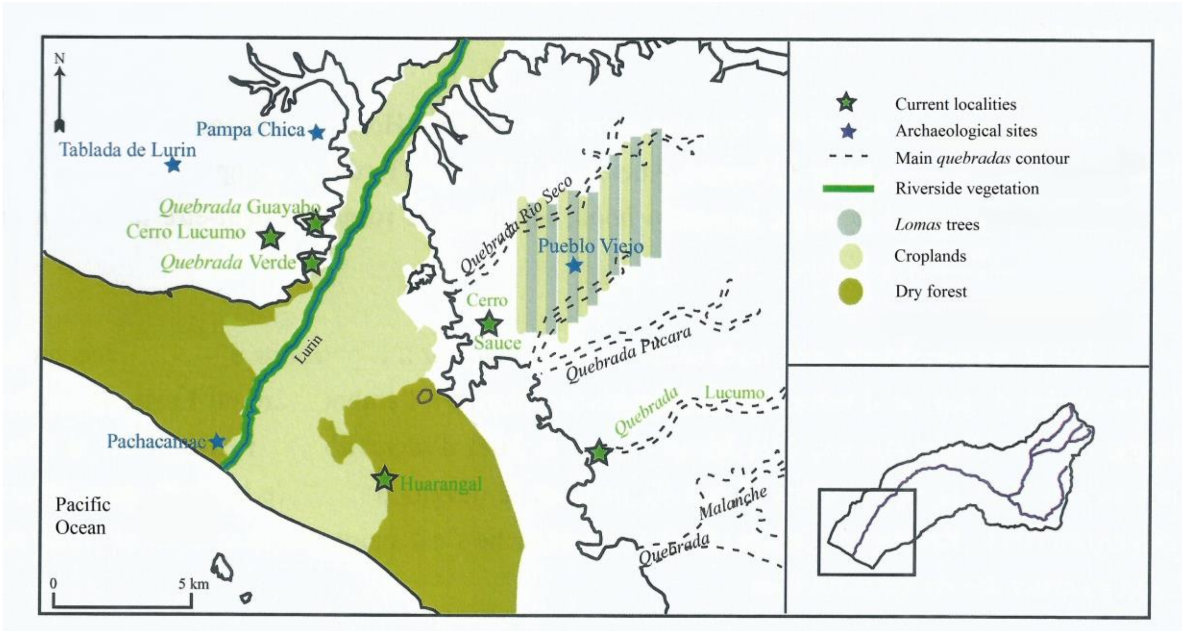

Figure 3.2: Proposal for Reconstruction of Ligneous Vegetation Location during the Late Periods in the Lower Lurín Valley (after Moutarde 2006:Figure 51).

The middle valley (also known as the *chaupiyunga*) was a strategic area, as it served as the connection between the littoral and the highlands. This warm region is not influenced by the cold fog that defines the lower valley and has an approximate elevation of 500-1000 meters above sea level. It is characterized by narrow and deep valleys and canyons, steep slopes, turbulent rivers, and heavy rainfalls that can produce large mudflows or *huaycos* (Peñaherrera 1986; Pulgar 1987). Although the available cultivable land is significantly smaller than in the lower region[23], the middle valley was valued in pre-Hispanic times as an important region for coca production[24].

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[23] Nevertheless, the middle valley can offer a potentially wider range of food crops. In addition to the species that grow in the lower valley, the *chaupiyunga* offers a greater variety of fruits such as avocado, lucuma, cherimoya, guava, and plum (Dillehay 1976; Pulgar 1987).

[24] The majority of the coca fields in this area belonged to the local gods and elite, but during the Late Horizon, they were appropriated by the central Inca ruler and gods (Rostworowski 1989).

3.2 Cultural History

As was previously stated, the Peruvian coast is composed of a series of river valleys which are separated by areas of desert. In theory, each of these valleys would have been largely self-sufficient, not needing the resources of the adjacent valleys. This is reflected in the presence of different pottery styles that are present in a single valley or a group of adjacent valleys, creating what we recognize as the “archaeological cultures” (Silverman 2004). Although these archaeological cultures are, in fact, primarily reconstructed on the basis of ceramic styles, they are assumed to represent specific social, economic, and ideological practices that made them particular cultural entities. The beginnings of this cultural differentiation can be traced to the earliest periods (Late Archaic-Early Formative), and it grew stronger through time. The interaction between cultural areas was a dynamic process that alternated times of negotiation, imposition, and appropriation (or a combination of these strategies). However, there were also changes in its territorial extension during the different periods, meaning that these groups were not static nor isolated entities.

Generally, the cultural sequence of Peruvian prehistory has been interpreted as a succession of largely isolated regional societies, which were integrated three times by a highlands’ group, starting with a religious cult (Chavín from Ancash, north-central highland), followed by two imperial conquests from the southern highlands (the Wari from the Ayacucho region and the Inca from Cuzco) (Silverman 2004). This succession of interregional disintegration and integration was systematized by Rowe (1960; see also Rowe and Menzel 1967), using a chronological approach in which ceramic styles are organized by time period[25].

[25] Another chronological model for the central Andes was elaborated by Lumbreras (e.g. 1969, 1972, and 1981). It uses an evolutionary approach, which prefers stages organized by economic or political criteria, and it is more often used among Peruvian archaeologists (Ramón 2005). Following Childe, Lumbreras proposed a gradual socio-economic sequence, divided into the following stages: Lithic (Hunter and Gatherers, 15000-3000 B.C.), Archaic (Village Agriculturalists, 4000-1200 B.C.), Formative (Despotic Urban Societies, 1200 B.C.-A.D. 100), Regional Development (Theocratic Reigns, A.D. 100-800), Wari Empire (Despotic Urban Societies and Militaristic States, A.D. 800-1200), Regional States (A.D. 1200-1470), and the Tawantinsuyo (or Inca) Empire (A.D. 1430-1532).

Rowe's sequence uses ceramic styles from the Ica Valley as a baseline. In this way, Rowe proposed the following sequence: Preceramic (PC) (3000 – 2100 B.C.), Initial Period (IP) (2100 – 1400 B.C.), Early Horizon (EH) (1400 – 400 B.C.), Early Intermediate Period (EIP) (400 B.C. – A.D. 550), Middle Horizon (MH) (A.D. 550 – 900), Late Intermediate Period (LIP) (A.D. 900 – 1450), and Late Horizon (LH) (A.D. 1450 – 1530)[26]. The problem with this sequence is that the evolution of hegemonic polities is a process that did not happen everywhere at the same time. In addition, collapses of these polities was a gradual process, so that the comparison among the different Andean areas is a difficult task.

Other chronologies have been proposed that complement or elaborate on Rowe's sequence. Based on the compilation of archaeological data that have been published in different books and papers (material culture, subsistence/cultural inferences, and some radiocarbon dates) and using his own research, Kaulicke (1994, 2007, 2010; see also Kaulicke and Dillehay 1999) offered a new timeline for the transition between the Preceramic to the Early Horizon, proposing the following periods: Archaic, subdivided in Early (~10000-~8500 B.C.), Middle (~8500-5000 B.C.), Late Archaic (5000-2600 B.C., with subdivisions still under construction), Final Archaic A (2600-2400 B.C.), Final Archaic B (2400-2000 B.C.), Final Archaic C (2000-1500 B.C.), Early Formative (1700-1200 B.C.), Middle Formative (~1200-800 B.C.), Late Formative (~800-600/500 B.C.), Final Formative (~500/400-200 B.C.), and Epiformative (~200 B.C.-A.D.100/200).

Silverman (2004) proposed some possible solutions for the problem that Rowe's chronological system represents for the study of the cultural history of the central Andes in societies with no connections to the Ica Valley. Making some adjustments to her proposal, I posit a sequence for the central coast, one that combines Rowe's stylistic sequence with Kaulicke's (2010) divisions and the latest studies in specific cultures of the area (e.g. Gierz and Makowski 2014; Goldhausen 2014; Vallejo 2004, etc.). This new scheme is explained below.

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[26] The years were taken from Rowe and Menzel (1967).However, they do differ in other publications.

Other timelines have been suggested for the central coast. For example, Palacios (1988), published a sequence of early ceramic for Huachipa (Rímac Valley), dividing the styles in Jicamarca (Early, Middle, and Late), Cerro (Early, Middle, and Late), Pinazo and Huayco (Initial, Early, and Middle); the two latest corresponding to the white-on-red ceramic tradition. Patterson (1966) produced a ceramic sequence for the Early Intermediate Period and the beginning of the Middle Horizon, beginning with the Miramar style (white-on red and three-color), that was followed by the Lima style (Lima 1-9). Due to the difficulties in applying this sequence, it has been simplified in Early (Lima 1-3), Middle (Lima 4-6), and Late (Lima 7-9); sometimes referring to Nievería (Lima 9)[27] as a separate style (Escobedo and Goldhausen 1999; Falcón 2000; Goldhausen 2001, 2014; Guerrero and Palacios 1994; Mac Kay and Santa Cruz 2000; Makowski 2001; Segura 2004; Valdez 2015).

Further subdivisions were also made to the Middle Horizon. This period was subdivided by Menzel (1964) into four phases (1A-B, 2A-B, 3, and 4), which has been used profusely without major changes for years. However, recent investigations with carbon dates from the Middle Horizon led Gierz and Makowski (2014) to re-elaborate Menzel's temporal subdivision as follows: MH 1A (introduction of Tiwanaku style in Ayacucho, A.D. 600-700), MH 1B (Wari cultural diffusion, A.D. 700-800), MH 2A (Wari consolidation in the coast, A.D. 850-1000), MH 3-4 (Wari collapse, A.D. 1000-1050).

The late periods, on the other hand, have been divided by Vallejo (2004) into Early, Middle, and Late Ychsma (each of them subdivided in A and B). Early Ychsma A probably began at the end of MH 4, while Late Ychsma B was contemporary with the Inca pottery style. The application of this sequence is problematic though, considering that according to ethnohistoric sources, the Ychsma was not the only ethnic group present in the central coast during those times, something that seems to be reflected in the diversity of ceramic styles in the area.

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[27] Although it was initially thought that Nievería was a post-Lima style, more recent investigations noted the association of Nievería with the late Lima styles, especially with Lima 8 and 9. It is also possible that the roots of the style could be in the EIP (Segura 2004).

The few radiocarbon dates available for the central coast can be used to refine the stylistic sequences still necessary in our area of study. The chronological sequence that is used in this dissertation is presented in Table 3.1.

Table 3.1: Chronological Sequence of the Central Coast Used in this Dissertation

Time Period		Approx. Date	Cultural manifestation
Early Colonial	Early Colonial	A.D. 1532	Spanish conquest
Late Horizon	LH	A.D. 1470	Inca
Late Intermediate Period	LIP	A.D. 1050	Middle and Late Ychsma
Middle Horizon	MH 3-4	A.D. 1000	Epigonal and Early Ychsma
	MH 1-2	A.D. 600	Late Lima and Wari
Early Intermediate Period	EIP B	A.D. 200	Early and Middle Lima
	EIP A	200 B.C.	White-on-red and Three-color styles
Early Horizon	Late-Final Formative	800 B.C.	Non-monumental centres
Initial Period	Middle Formative	1200 B.C.	U-temple
	Early Formative	1500 B.C.	Sedentism? U-temple
Preceramic	Late-Final Archaic	5000 B.C.	Monumental mounds
	Middle Archaic	8500 B.C.	Semi-permanent villages
	Early Archaic	10000 B.C.	Paiján tradition

*Dates from the Pre-ceramic to the LIP were taken from Gierz and Makowski 2014; Kaulicke 2010; and Kaulicke and Dillehay 1999

3.2.1 Preceramic /Archaic Period

During the Early Archaic period, the central coast was part of the Paiján lithic tradition. Paiján sites were open-air settlements concentrated in the north coast, but can be found in several coastal valleys (from Cupisnique in the north, to Ica in the south coast) and up to 1500 m, indicating that these people exploited various habitats and resources (Dillehay et al. 2004; Kaulicke 1994)[28].

The Middle Archaic is characterized by the introduction of bifacial points on the central and north-central coast, similar to those used in the highlands; suggesting a possible intensification of the contact between those areas, a phenomenon that is even more accentuated in the south (Kaulicke 1994). The first evidence of domestication was found in the north/north-central coast area, in Zaña (~5000-4000 B.C.) (Dillehay et al. 1997; Rossen et al. 1996) and Huarmey (4000-1800 B.C.) (Bonavia 1996).

During this period the population rose, leading to the development of some semi-permanent villages of considerable size in the central and south-central coast, especially in the *lomas* (e.g. Paloma and Chilca). The dwellings were made with vegetal material, and were used as living and burial places (Donnan 1964; Engel 1963, 1978, 1980, 1987, 1988; Quilter 1989). In his analysis of the burials of Paloma (and the comparison with other nearby and contemporaneous sites) Quilter concluded that "if social inequalities existed, they were probably not supported by laws or customs which restricted social mobility" (Quilter 1989:85). Quilter also noted that although equal burial treatment was the norm, there were also certain males who received special treatment. Conversely, some females in Chilca were staked to the ground in a "punishment-like" manner (Quilter 1989).

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[28] The archaeological sites of Amopate and Paiján from the north coast show the earliest evidence of human occupation of the Peruvian coast (9000-8200 B.C.) and are associated with Paiján and Fishtail points, and unifacial tools (Dillehay et al. 2004). However, the chronology of these technologies is still the subject of debate. It is also possible that earliest evidence of human occupation on the coast (chronologically comparable with those that are found in the highlands) is still to be discovered (Briceño 1999; Kaulicke 1999; Kaulicke and Dillehay 1999).

Other investigations at Paloma (e.g. Benfer 1982, 1990, 1999; Engel 1980) suggested that the Archaic period on the Peruvian central coast was a time of dynamic adaptation to the continuous changes of the terrestrial and maritime environments (Meadors and Benfer 2009).

Osteological analysis has established that around 5700 to 4800 B.C every aspect of life in Paloma was changing, but these changes were not visible technologically and apparently they did not affect the funerary customs dramatically (Meadors and Benfer 2009). However, Quilter (1989) noted that females had fewer grave goods during the late phase of the site, probably reflecting a diminution of the status of women as the *lomas* resources declined. My own reanalysis of Engel's (1980) and Quilter's (1980, 1989) funerary data from Paloma shows a progressive decrease of the social importance of females and children in favour of males, seen in the changes of the variability (not of the quantity) of the associated material, the relation individual-hut, and some features of the burial pit (Vega 1998).

By the end of the Late and Final Archaic, there was an increase in social complexity and economic synchronization among the Peruvian central coast, north coast, and north highlands that made them an interrelated cultural area (Burger 1985; Dillehay et al. 2004; Isbell and Silverman 2002; Kaulicke 1994). Therefore, the central coast was culturally influenced at this time by the north-central coast and the north and north-central highlands, with the beginning of monumental edifices that shared some common characteristics, such as anthropomorphic clay-made figurines and the introduction of domesticated species (Final Archaic A).

The architecture of the north-central coast exhibited a certain degree of complexity in its construction, and it was characterized by the presence of platforms, terraces, agglutinated rooms, and stone walls with mud fill and mortar, plastered in the posterior part; with a central circular hearth, underground duct, and internal niches (e.g. Casma, Las Aldas, Culebras, Caral, Cerro Lampay, and Bandurria). Some of these characteristics are also found in the architecture of the north coast (e.g. Alto Salaverry and Salinas de Chao), and the Chillón Valley (e.g. El Paraíso). However, the north can be considered a separate tradition (Kaulicke 1994, 1998), recently named the North Central Coast Tradition (Vega-Centeno 2005). The “Norte Chico” area (Fortaleza, Huaura, Supe, and Pativilca valleys) presented the highest concentration of these sites, which, albeit not presenting a consistent layout pattern, shared some features like the sunken circular plaza (Haas and Creamer 2004).

During the Final Archaic B or C the site of Buena Vista (a ceremonial site, possibly a calendaric temple) appeared in the Chillón Valley (Benfer 2012; Benfer et al. 2007). The presence of some individuals with sumptuous associations in other sites of the north-central coast and north-central highlands could indicate the beginnings of a social stratification in these periods (Kaulicke 1994).

Bioarchaeological Research

Skeletal studies of 201 individuals in a good state of preservation of Paloma have documented the pattern of human activity, the changes in the diet in response to a degraded *lomas* environment, and the improved state of health in the site. The shift to sedentarism improved the overall health, as seen in the reduction of anemia indicators (i.e. cribra orbitalia) and in the increment of the population stature. Diet became also more uniform between males and females (Benfer 1984, 1990; Meadors and Benfer 2009; Vradenburg 2001). Periosteal lesions, possibly related to a nonveneral (yaws-like) treponematosis affected 22% of the adults and 11% of the subadults (Pechenkina et al. 2007:105 and Table 7.4). Based on dental studies and changes in the mortuary customs, Benfer (1990) concluded that by its latest phase (approx. 5200 B.P.) the Paloma population was almost completely replaced.

Pechenkina and colleagues’ (2007) work on osteological material from different sites onthe central coast showed that the prevalence of caries and physiological stress indicators (e.g. cribra orbitalia, porotic hyperostosis, and enamel hypoplasias) increased at the end of the Preceramic period. This tendency was maintained during the Initial Period, and was possibly related to the growing reliance on starchy cultivated plant foods and the rise in the population density. Equally, chronic anemia became an important contributing factor to mortality among subadults, also affecting the population in subsequent time periods. Generalized periosteal lesions were found in 30% of the adults of Asia Beach and 50% of the adults from Río Seco (Pechenkina et al. 2007:Table 7.4).

3.2.2 Initial/Early-Middle Formative Period

This period is technologically characterized by the appearance of pottery, which did not occur simultaneously throughout the region[29]. Some authors have stated that the Initial Period was the time of the development of sedentism, possibly related to rise of population size, an increased dependency on agriculture, and the development of a rigid social stratification (e.g. Fung 1988; Lanning 1967; and Pozorski 1983, 1987). However, other authors do not believe that strong social differentiation had yet occurred (Burger 1992; Collier 1955; Patterson 1983). The presence of differential burial treatments in Ancón (Chillón Valley) and Cardal (Lurín Valley) indicates the presence of individuals with special status but not of leaders (Burger 1992; Burger and Salazar 2012).

During the Early Formative period the process of increasing complexity was consolidated, producing a separation into more defined cultural areas. The northern region showed an increase of population and complexity, as is seen in the number, size, and complexity of their monumental centres, especially in Casma (Isbell and Silverman 2002; Kaulicke 1994, 2010). This valley probably became the new centre, coinciding with the decline of the North Central Coast Tradition (Kaulicke 2010). The definition of this period is difficult in the central coast. The only evidence lies in the presence of ceramics in Ancón, but no architecture of this period has been found. However, it is possible that the U-temple tradition that defines the Middle Formative had its origin in the Early Formative (Kaulicke 2010).

By the Middle Formative period, the monumental sites of the Casma Valley were abandoned (Kaulicke 2010). The central coast, from Chancay to Lurín, exhibited the U-temple tradition (a construction formed by a central building and two arms that surrounded a large plaza (Williams 1971, 1978-1980, 1985), and received influence and

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[29] On the central coast, the earliest evidence for pottery was found in Ancón (Chillón Valley) and La Florida (Rímac Valley) (Burger 1992), dating around 1400/1200 B.C. (Kaulicke 2010).

objects of the north-central coast (Casma-Supe) and north-central highlands (Chavín de Huántar) (Burger 1992; Kaulicke 1994), implying the presence of large interaction networks of sumptuous goods between the three areas (Kaulicke 2010)[30]. Burger and Salazar (2009b) argued that the U-temples functioned at the same time (at least in the lower Lurín Valley) during the end of the Initial Period, probably representing roughly similar independent social groups related to the construction of a (still unidentified) canal system[31]. The rise of the population at the end of the Initial Period could have triggered tensions over the use of the irrigated lands associated with these canals.

There are two main interpretations of the society that constructed the monumental architecture from the Archaic and Formative periods of the central coast and northern valleys. The first states that the monumental architecture was the product of cooperative labour built by societies organized more simply than a complex chiefdom or state (e.g. Burger 1987, 2009; Burger and Salazar 2009a, 2012; Narváez 2013; and Vega-Centeno 2010), possibly organized in a heterarchic model (Narváez 2013:421-422). These proposed agriculture/religion-based and politically acephalous societies used these centres to integrate the population through rituals and periodic social events, where families and lineages united under a common identity to perform joint activities which included the burial and renovation of public architecture (Burger 2009). These rituals could have been performed as a way of negotiating power positions and of interacting with the neighbour populations (Vega-Centeno 2010).

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[30] In the central coast, the predominant ceramic style was characterized by high plates and simple bottles with geometric decoration. However, Chavín's Dragonian style (characterized by a dominant mythological fanged being) can also be found (Kaulicke 1994).

[31] Besides the large centres with public architecture, Burger (1992:69) also recognized two other types of settlements in the central coast during the Initial Period: small shoreline villages (e.g. Ancón and Curayacu) and small inland hamlets (e.g. Chillaco and Palma in the middle Lurín Valley).

The second position argues that the leaders of these societies used their power (founded on economy, ideology and possibly force[32]) to coerce people to build the monumental complexes, holding control over the irrigation system, the distribution of products, and the religious ideology (Haas and Creamer 2012; Pozorski and Pozorski 2012). According to Pozorski and Pozorski (2012:392-393), "these elites likely competed for prestige with leaders in the other coastal valleys in a peer-polity fashion […]". These societies possibly reached an early state level (Shady 2006; Shady and Leiva 2003) and were ruled by a "benevolent dictatorship" (Pozorski and Pozorski 2012:391).

The stability and continuity of the Initial Period tradition, maintained for more than 1000 years was abruptly ended in the north and central coast, seen in the unfinished portions of the public architecture on sites such as Cardal, Sechín Bajo, and Las Aldas, possibly reflecting a great disarticulation of the social organization at the end of the Initial Period (Burger 1993; Burger and Salazar 2009a). This disarticulation has been related to a combination of internal disasters expressed in the population health (e.g. Vradenburg 1992) and foreign military invasions (e.g. Pozorski 1987; and Pozorski and Pozorski 1987).

Bioarchaeological Research

The osteological collection of Cardal, composed of 43 individuals[33] was studied by Meadors (1992) and Vradenburg (1992, 2009). Meadors' master's thesis was centred on trace elements to establish diet, while Vradenburg's investigations focused on different osteological indicators of stress. Vradenburg suggested that the Cardal population had a diversified subsistence system and presented a generally poor health status (especially infections, some attributable to a yaws-like treponematosis) that decayed through time and affected females more intensely (associated with a possible diet differentiation that

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[32] Kaulicke (2010:398) stated that albeit there is still no convincing evidence, the religious iconography shown in the monumental centres and sumptuous objects is not consistent with a "pacific religion", and that human head-hunt and aggressive tactics of enrichment were possibly used.

[33] Only 21 of these individuals were complete skeletons (Vradenburg 2009:Charts 1, 2 and 3).

started since childhood). Generalized periosteal lesions were present in 50% of the adults and 75% of the subadults (Pechenkina et al. 2007:Table 7.4). He also noted that the Cardal population seemed to be significantly less healthy than the Preceramic populations of Paloma and La Galgada, and that cranial modification was introduced (or became popular) during the last phase of the site's occupation (Vradenburg 2009). Trace element analysis suggested that there was a shift from sea product consumption to a greater dependency of terrestrial plants (Meadors and Benfer 2009).

3.2.3 Early Horizon/Late and Final Formative Period

According to Burger (1993), the Chavín horizon was a short moment in Andean prehistory (between the 5th and 3rd centuries B.C.), in which unalike non-related societies were unified in a single religious system, allowing a peaceful integration of the new regional and the earlier local religious ideologies. Conversely, Kaulicke (2010) stated that the Late Formative is defined by its diversity and that Chavín was not the "centre of irradiation" of a pan-Andean cult, but part of an exchange network. According to Burger (1993), this period represents the shift from unstratified societies to militaristic, class-based polities.

Different lines of evidence indicate that between the end of the Initial Period and the beginnings of the Early Horizon (900-700 B.C. approx.), central coast communities abandoned the local centres (a phenomenon also seen in the north coast) and for many centuries (until the Early Intermediate period), did not build new monumental architecture (Dulanto 2009; Kaulicke 1994). This phenomenon coincides with the increment of south coast pottery decorations (Kaulicke 1994). By the time the Chavín cult was expanding, the ability to mobilize collective labour to build public architecture was declining in the coast. However, some fishing communities such as Ancón and Curayacu continued unaltered. There is also evidence of an increased consumption of camelids in the north, central, and south coasts, suggesting an increased dependency on adjacent highland areas (e.g. Burger 1993; Szpak et al. 2016).

Some authors have suggested that the abandonment of the U-temples for non-monumental complexes in the Early Horizon reflected a time of changes and crisis

(Burger 1992; Dulanto 2009). However, Dulanto (2009) argued that the actual evidence does not allow one to characterize this "crisis" as a period of severe destructuration or restructuration of the economic, social, political, and ideological power networks organized around the U-temples that led to a population reduction or displacement. Instead, he proposed that the old power networks reorganized around the new non-monumental centres, such as Pampa Chica, which could function as centres and foci of identity, following a similar ideology to the Initial Period, but concentrating on smaller populations. This fragmentation could be related to increased interregional contacts and the subsequent associated intensification of exchanges of goods and ideas.

By the Final Formative many monumental settlements of Nepeña, Casma and Santa (including fortified sites) appeared in the middle-high valleys, a possible sign of the institution of conflicts (Kaulicke 2010).

The Late and Final Formative periods also witnessed at least two possible natural disasters: a mega El Niño (~500 B.C) (Nials et al. 1979) and a tsunami that disrupted the north coastline (Bird 1987). In addition, a steady climatic deterioration began in the coast around 500 B.C., lasting many centuries (Moseley et al. 1981).

Bioarchaeological Research

Unfortunately, the available osteological information from this time period is limited to two complete skeletons and isolated and commingled remains (MNI = 18) from Pampa Chica. Dulanto reported antemortem fractures in two ribs, two radii, a metacarpal, and a metatarsal (Dulanto 2008:320).

3.2.4 Early Intermediate Period

For the Final Formative/start of the Early Intermediate Period, there were new ceramic decorations and forms on the central coast (from Lurín to Chancay), such as stamped circles (related to Sajara-patac style from Chavín), relief decoration, and stirrup-spout bottles (known as the white-on-red style or Miramar) that showed contacts with the north coast and a strong influence from the south coast (Kaulicke 1994, 1998; Narváez 2014; Patterson 1966; Silva 1992, 1996). After the collapse of the ceremonial centres and the complex religious iconography, it seems that a complete restructuration of the political order occurred, and clearer signs of social differentiation appeared (especially in the cemeteries of Lurín), in the form of headdresses and weapons of gilded copper, adornments of sodalite and *Spondylus*, and some gold objects (Makowski 2002b, 2009a). Copper objects (sometimes gold plated), ornamental maces heads made of stone, and other sumptuous objects were also found in an early Huayco cemetery of Huachipa, middle Rímac Valley (Palacios 1988:20).

The north margin of the lower Lurín Valley presents a series of cemeteries containing more than 1500 burials, many more than in any other coastal valley (e.g. Tablada de Lurín, Villa El Salvador, Limay, El Panel, Las Esteras, and El Ferrocarril) (Makowski 2009a). Although the material from Tablada de Lurín and El Panel-Las Esteras-Ferrocarril (these three possibly part of a single large cemetery) shared some similarities, some practices, especially the orientation of the individuals, were different. While the corpses in Tablada de Lurín were placed in a sitting position, with their faces toward the east or north-east (to the highlands), individuals in El Panel were buried also in a sitting position, but with their faces toward the west or south-west ("looking" to the ocean)[34], suggesting that two different groups (mid-valley vs. littoral?) of the same cultural tradition were burying their dead in two different places (Maguiña and Paredes 2009; Makowski 2009a)[35].

According to Makowski (2009a:235), despite the lack of monumental architecture and the dispersed settlement pattern, the lower Lurín Valley exhibited signs usually associated with an organized society, probably a complex chiefdom, which controlled the valley and possibly subdued the littoral population. It seems that the society of the central coast at the beginning of the Early Intermediate Period was a confederation of small ethnic groups that shared a similar religious ideology, centred on funerary practices

[34] A similar orientation was found in the cemeteries of Limay (Cáceres 1998) and Villa El Salvador (Stothert and Ravines 1977).

[35] Alternatively, Maguiña and Paredes (2009) have hypothesized that El Panel and Villa El Salvador were part of a same cemetery.

and community integration, based on direct or indirect kinship and on the recognition of a common origin (Makowski 2001; 2002b; Stothert 1980). It is thought that this transitional time (which preceded the formation of the Lima culture) was a period of intense conflict (e.g. Lumbreras 2011). This idea is compatible with the evidence of interpersonal violence (e.g. circular depressed fractures in skull and parry fractures) found in Villa El Salvador and Tablada de Lurín (Vradenburg 2001:Table 24) and in Cerro Punta Blanca, a lime mining settlement of the Lurín *lomas*, that led Altamirano and Jave (2013) to propose a possible conflict between people of the *lomas* and the littoral.

Later, a ceramic style known as Lima[36] appeared in the lower and middle sections of the Chancay, Chillón, Rímac, and Lurín valleys. This ceramic style is characterized by its Interlocking design[37] and mammiform jars. This style is also associated with a special pattern of burials and the construction of large adobe mounds (e.g. Templo Viejo of Pachacamac, Huaca San Marcos, Cajamarquilla, Huallamarca, and Pucllana), that together are known as the Lima culture (A.D. 200-700).

At this time, agglutinated settlements appeared in the upper part of some hills (e.g. Pan de Azúcar in the Lurín Valley) and the large cemeteries fell into disuse. In the Chillón Valley, there was a shift from habitational sites located on the valley floor to sites placed along the edges of the valley. The bigger size and number of these sites with respect to the previous time period suggests a rise in the size of the population (Patterson and Lanning 1964).

The first Lima ceremonial buildings were located very close to the coast. Progressively, new civic-religious centres appeared closer to the middle valley, a process that ended during the Late Lima phase (Escobedo and Goldhausen 1999; Silva 1996). It was also proposed that by the end of the EIP, members of the Lima culture expanded to Lurín due

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[36] It has also been known as Proto-Lima, Interlocking, Playa Grande, or Maranga (Kaulicke 1997:8).

[37] Interlocking is described as a large stylized design that represents a two-headed snake with triangular head and serrated body. The ritual and elite pottery present foreign iconography, inspired by designs from the north highland (Recuay) (Makowski 2009a:235).

to demographic pressure (Earle 1972, MacNeish et al. 1975), incorporating highland groups and settlements (Patterson et al. 1982). It is also thought that an irrigation system was built in the Chillón and Rímac valleys during the latest part of this period (Patterson and Lanning 1964)[38].

The Lima culture shared some features with the contemporary Moche of the North Coast, such as the construction of large mounds and burials in extended position. However, funerary practices among the Lima included the placement of the body on litters (Goldhausen 2001; Mac Kay 2007)[39], and a north-south orientation (Stumer 1953, 1954). Although high and low status individuals can be identified, this difference is not as marked as in other regions of the central Andes during this period (e.g. Moche and Nazca cultures)[40]. There is also evidence that suggests that the Lima people had middle and long distance contact with the highlands (e.g. Cárdenas 1974-75; Farfán 1995; Mac Kay 2012) and the Amazonian lowlands (e.g. Stumer 1953, 1954). According to Lumbreras (2011), the Lima society (as well as other Andean cultures of the same period) was affected by wars between the 4th and 5th centuries. The paleo-environmental reconstruction of tropical precipitation trends done by Thompson and collaborators (1985) showed a severe drought between A.D. 570 and 610 (in the transition between the Middle and Late Lima periods).

There is no consensus about the complexity of this society, especially regarding its regional variability and change through time (DeLeonardis and Lau 2004). Some authors

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[38] Nonetheless, recent investigations by Narváez (2013) have established that at least part of this irrigation system was constructed during the first half of the Early Horizon Period (~800-600 B.C.)

[39] This funerary practice started in the white-on-red period (Willey 1943) and ended in the beginnings of the MH (Late Lima-Nievería phase) (Kroeber 1954; Sestieri 1971).

[40] Burials of high status individuals presented camelid fiber textiles, decorated with Interlocking designs, necklaces, fire-ware ceramic, figurines, *Spondylus*, and exotic items such as birds and monkeys (Barraza 2000; Stumer 1953). However, it is possible that this relative poverty does not reflect the true extension of the social division (Kaulicke, 2000).

(e.g. Escobedo and Goldhausen 1999; Lumbreras 2011; and MacNeish et al. 1975)[41] see in Lima an already developed state, while others do not (e.g. Earle 1972 and Narváez 2013)[42]. A more conservative position has argued that the evidence is still insufficient to prove whether the Lima culture was a state or not (i.e. Silva 1996).

According to Dillehay (1979), there were different ethnic groups occupying the Chillón mid Valley. Something similar has been proposed for the other valleys of the central coast. At least in the latest part of this period, with the growth of Maranga in the lower Rímac Valley, and Cajamarquilla in the middle Rímac Valley, there is evidence that would indicate the presence of multi-ethnic and multi-valley polities (Canziani 1987; Shady 1982).

Bioarchaeological Research

Beside the cases of interpersonal violence previously mentioned in this chapter, various cases of treponematosis were detected on human remains from cemeteries dating from the beginnings of the Early Intermediate Period such as Tablada de Lurín, Villa El Salvador (Pechenkina et al. 2007; Vradenburg 2001) and Cerro Punta Blanca (Altamirano et al. 2013). The absence of cases of generalized periosteal lesions in subadults in Tablada de Lurín and more recent sites of the central coast made Pechenkina and colleagues (2007) suggest that a possible change in the mode of transmission of this

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[41] According to Escobedo and Goldhausen (1999:31-32), Lima was a state that was clearly divided into social segments, with a dominant sacerdotal group that claimed goods and service from the rest of the population, using the interlocking design as the means of dissemination of ritual ideas that hide its political goals for power. Lumbreras (2011:342) argued that the Lima (named by him the "Maranga kingdom") was a state in which the chief or "king" had a supra-communal power.

[42] Earle (1972:476) thought that the Lima culture did not reach a regional organization. Instead, each Lima unit in the Lurín Valley was politically and economically self-sufficient. Narváez (2013:428) argued that Lima was a simple or complex chiefdom with a centre (Maranga), and a second (Makatampu or Pucllana) and third levels of settlements.

disease (from contact to venereal) took place during this period or during the Early Horizon[43].

Other osteological analyses have been conducted on the Tablada de Lurín sample. Cárdenas (1999:22-25) present six possible cases of human sacrifice with head and limb mutilation. Makowski and Tomasto also recorded a few individuals buried in an extended position and outside the funerary core, who were incomplete and had evidence of a violent death (Makowski 2002b; Tomasto and Makowski 2007). Vivar (1998, 1999) analyzed 86 of the adults recovered at the site, concentrating on craniometrics and some cranial and dental anomalies. Among her findings are the presence of cranial modification in 59.6% of the males and 46.2% of the females and auditory exostoses in 74.5% of the males and 66.7% of the females. She also mentioned some cases of fractures and "superficial lesions" in long bones and the cranium (Vivar 1999:12, 16). Karol Piasecki (1999:67) also calculated cranial indices of 138 skulls (almost all of them with pronounced modification), finding differences among the different sectors of the site[44]. Vradenburg (2001) revised the content of the *cista* EF 3 excavated by the PATL-PUCP, registering a MNI of 28 (5 subadults, 12 adult males, and 11 adult females) and finding cases of treponematosis, a high prevalence of non-specific stress indicators (50% in males, 88% in females), and only two cases (a probable female and a male) of healed depressed compressive fractures to the left side of the frontal bone.

Based on the multivariate analysis of 64 individuals from Villa El Salvador, Pechenkina and Delgado (2006) found that the cemetery was used by two social groups of different geographic origins (one local and the other possibly from the upper Lurín Valley), that differ in skeletal characteristics related to childhood health. Cranial modification was

[43] The prevalence of possible treponematosis cases dropped dramatically in the next period, as was seen in the collections of Cerro Culebra analyzed for this study, and in Huaca Pucllana (Pechenkina et al. 2007:105), and it remained low for the rest of the pre-Hispanic sequence.

[44] Vivar (1999) and Piasecki (1999) publications also included craniometrics data Villa El Salvador and El Panel.

probably a marker of ethnicity. A relation between status and male labour (seen through the advancement of degenerative joint disease) was also found.

At the time this dissertation was being written, there were no published data available for Early or Middle Lima individuals.

3.2.5 Middle Horizon Period

During the MH1, Late Lima and the Nievería[45] ceramics styles appeared together (Goldhausen 2014; Guerrero and Palacios 1994; Kaulicke 2000; Mac Kay and Santa Cruz 2000; Marcone 2000; Mogrovejo and Segura 2000; Segura 2001, 2004; Shady and Narváez 2000; Valdez 2015), defying the long assumption that Nievería was a post-Lima style. These ceramic styles were associated with the extension and subsequent abandonment of monumental centres and villages (Ángeles and Pozzi-Escot 2010; Patterson and Lanning 1964) and the end of the predominance of the interlocking motif (Escobedo and Goldhausen 1999; Falcón 2003; Goldhausen 2001). The funerary pattern changed from the previous burials of extended bodies laid on litters to a combination of extended and flexed bodies (some of them seated), possibly wrapped in textile bundles (Escobedo and Goldhausen 1999; Ravines 1977).

Some scholars have stated that at this moment the central coast went through a political transformation (i.e. increase of public architecture, growth of the irrigation system, and territorial expansion) that led to its transformation into a state-level polity (e.g. Earle 1972; Goldhausen 2001; MacNeish et al. 1975; and Marcone 2010). Although it seems that all the major centres could have coexisted during the Late Lima phase, they could also have been part of a city-state system (Kaulicke 2000). Marcone (2000) argued that the Lima elites maintained their political independence while copying symbols of more

[45] Nievería is a fine paste ceramic with polished surface treatment that combined Lima and Wari (Ocros and Chakipampa) shapes and decorations and presents influence from Moche V and archaic forms (Kaulicke 1997; Menzel 1964, 1968). It had its centre in the Rímac Valley, appearing in tombs of individuals of special status and ritual contexts. Apparently it was prestigious and related to local elites, judging for its presence in tombs of different coastal and highland societies (Kaulicke 2000; Shady 1982).

prestigious states. At the same time, the use of Lima elements maintained the loyalty of the locals.

The Late Lima phase presented a dense occupation, with evidence of expansion of the sites, especially in the Rímac Valley (e.g. Maranga, Pucllana, Cajamarquilla, and Huaca Trujillo). The Late Lima territory included the west facing highlands with limits in Ancón (north) and Lurín (south). Contacts with the north and south coasts existed (Kaulicke 2000). In contrast, various sites of the north portion of the area (Chillón and Chancay) seem to have been abandoned (Kaulicke 2000). In Lurín, the Pachacamac mounds were built, incorporating a possible sacrifice of some 100 individuals (Kaulicke 2000:320). Other evidence of human sacrifices was found at Huaca Pucllana and Maranga (Barreto 2011, 2012; Flores 2005).

There are some hints of the occurrence of at least one El Niño phenomenon during this period, such as the presence of sharks in the ceramic iconography (Apolín and Vargas 2006; Escobedo and Goldhausen 1999; Goldhausen 2001; Palacios and Guerrero 1992; Vargas 2006:) and the molluscan assemblage of Huaca 20 in the Maranga complex (hereafter simply "Huaca 20"), that revealed changes in the stability of the environment during its Late Lima A phase (Mauricio 2012). More direct evidence was found in the presence of alluvial deposits and associated destruction (with later reconstructions) of architecture in Huaca 20 that happened during the Late Lima A phase, related to a Mega Niño event that could have occurred around A.D. 600 (Mauricio 2012; Mauricio et al. 2009; Olivera 2009, 2015a). Similarly, the abandonment of the Templo Viejo of Pachacamac during the Late Lima phase and the destruction of the canal system of Cajamarquilla were associated with the deposition of sediments from strong precipitations and *huaycos* (Franco 2004; Franco y Paredes 2000; Mogrovejo and Makowski 1999). This catastrophe was also recorded on sites of the north coast (e.g. Kaulicke 1993; Shimada 1994; and Uceda and Canziani 1993). These findings are supported by the data of the Quelccaya ice cap that indicates an event with strong pluvial precipitation between A.D. 610-650 (Thompson et al. 1985). The climatic changes related to this Mega Niño could have led to a socio-political restructuring of the sites, including some expansion to the west facing highlands, concentrated in the Rímac valley and limits in Ancón (north) and Lurín (south), and establishing contacts with the north and south coasts (Kaulicke 2000).

During the MH 2, the Pachacamac style[46] was introduced at the monumental site of the same name, together with the Teatino style[47] (from the north-central coast and northern section of the Rímac Valley) and some Viñaque and Atarco designs (Ángeles and Pozzi-Escot 2010; Kaulicke 1997, 2000; Menzel 1964, 1968), and new funerary practices such as individuals wrapped in bundles in a sitting flexed position (Ravines 1981; Sestieri 1971)[48]. By this time, Pachacamac had become an important centre of pilgrimage, probably associated with the oracle of Pachacamac. Nevertheless, the presence of this style in the Rímac Valley is extremely rare and was probably limited to the presence of the Templo Pintado (Painted Temple) of Pachacamac and some funerary and ritual contexts (Kaulicke 2000; Segura and Shimada 2010). On some sites (e.g. Chakipampa style in Huaca 20), the Wari evidence is limited to ceramic fragments found superficially or in architectural fills (Mac Kay and Santa Cruz 2000:590; Mauricio 2012:172, 2015a:60). Of all the major Late Lima sites, Huaca San Marcos is the only one that was not abandoned during the MH 2, judging by the fills of refuse and Nievería and Pachacamac sherds that were sealing an old Lima passage (Narváez 2013; Shady and Narváez 1999, 2000).

The strongest evidence for the Wari presence in the central coast comes from the elite Wari tombs found intruding into the abandoned mounds of the Rímac Valley such as Pucllana (Flores 2005, 2013)[49] and Cajamarquilla (Mogrovejo 2000, 2001; Mogrovejo

[46] The Pachacamac style is defined as a fine ceramic, with the Pachacamac griffin as its most distinctive design. It can be found from the Ica Valley (south coast) to the north coast (Menzel 1964, 1977).

[47] Teatino was a ceramic style that appeared between the Huaura and Chillón Valleys during beginnings of the MH and lasted until the LIP. It was conformed basically by monochromatic burnished pots, jars and bottles, which presented generally incised and geometric decoration (Bonavia 1962; Kaulicke 1997; Villacorta and Tosso 2000).

[48] Radiocarbon samples from Pucllana date the consolidation of the Wari Empire around AD 850-870 (MH 2-3) (Flores 2013:84).

[49] Isabel Flores (2013) stated that the Wari tombs of Pucllana were buried in a short time span of 20 years.

and Segura 2000; Sestieri 1971), as well as in the Chillón Valley (Patterson and Lanning 1964). Nevertheless, the site of Ancón has provided the most numerous excavations of Wari funerary bundles (e.g. Kaufmann 1994; Kaulicke 1997; Menzel 1964; Ravines 1981; Reiss and Stübel 1880; and Strong 1925).

The monumental site of Pachacamac presents the clearest evidence for the presence of Wari in this area. Numerous funerary bundles were recovered at the site, along with important contemporaneous architecture (Templo Viejo or Old Temple), and "Pachacamac style" ceramics (e.g. Franco and Paredes 2000; Kaulicke 2000; Uhle 2003 [1896]). Some authors have stated that during this time Pachacamac was a powerful and influential religious and political centre (e.g. Lumbreras 1999; Menzel 1977). However, the social foundations and the processes/mechanisms used to transform the ideologies and rituals into social, economic, and political power and wealth are still unknown. There is also no evidence that indicates that the Pachacamac-style ceramics were produced at the site (Shimada et al. 2010). After a series of strong precipitation events, the Painted Temple of Pachacamac was abandoned and replaced by the Templo Pintado during the MH 3 (Franco and Paredes 2000).

This evidence has led to the conclusion that Wari did not adopt direct mechanisms of control on the central coast, and that certain independent, local and regional identities were maintained in the area, coexisting with stronger interregional relations (Kaulicke 2000). According to Marcone (2010:137), Lurín was shifting from a political entity in the process of expansion and centralization, to a situation in which the complex and centralized forms of organization were abandoned and the population had disappeared. Conversely, Narváez (2013:429) interpreted the findings as evidence of a very violent incorporation of the central coast to the Wari political system, which included the eradication of the local elites.

During the MH 3 and 4, the Epigonal styles (e.g. Teatino, Pachacamac II-D, and Middle Ancón II) appeared, coinciding with the supposed abandonment of Huari[50], the capital city of the Wari Empire (Menzel 1964). These ceramics "were commonly inferior in craftsmanship to those of the preceding era and typically simplified, localized, less formal versions of the Wari and Pachacamac or their related styles in Epoch 2" (Shimada 1991:XXVII). Pachacamac apparently lost prestige and the central coast started receiving influence from the north coast, including from the Sicán site of Batán Grande (Shimada 1991). By the end of the Middle Horizon, the ceramics of the actual Lima area shared similar characteristics with the northern valleys of Chancay and Huaura, but during the LIP, styles became regionalized (Guerrero 2004:166). The shift to these poorly decorated and finished vessels has been interpreted as the reflection of the political disorganization and anarchy that characterized the post-Wari period (e.g. Flores 2005).

Bioarchaeological Research

Published bioarchaeological data are available for several Late Lima sites. Of the around 890 Late Lima individuals recovered in Huaca 20 of the Maranga Complex, only 287 have been analyzed and published (Vega 2015a)[51]. My analysis shows a higher mortality among young adults and subadults younger than three years, compared to other age cohorts. The prevalence of porotic hyperostosis/cribra orbitalia (possible related to anemia) was 87.1%, contrasting with the few cases of possible treponematosis (affecting only 3.2% of the male adults). Malintent trauma (most of it antemortem) was found in 25% of the male adults, 21.7% of the female adults, and 7.7% of the subadults. Differences in the distribution of fractures, arthropathies and dental pathologies were found between males and females, as well as between possible artisans and non-artisans, implying gender and activity differences in this population.

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[50] The spelling follows the convention proposed by Isbell (2001:457) of use the term "Wari" to refer to the Empire, and "Huari" to refer to its capital city.

[51] A few of these individuals were also analyzed by Judith Vivar (1998), who concentrated in craniometrics.

Cases of healed fractures, most likely related to accidents rather than interpersonal violence were also found, as well as some cases of osteoarthritis, possible malnutrition, and few cases of tuberculosis and treponematosis were found in the Maranga area (Barreto 2014:212-213). Around 50% of the sample from Huaca Pucllana presented pathological lesions, including trauma, degenerative arthritis, dental pathologies, two possible cases of tuberculosis (Barreto 2013a:49) and one case of diffuse idiopathic skeletal hyperostosis (DISH) (Barreto 2013b:307).

The remains of a young male showing non-specific stress markers (e.g. porotic hyperostosis, cribra orbitalia, and linear enamel hypoplasias), a modified skull, rib fractures (produced close to the death of the individual) and healed fractures in the left wrist and hand (associated to a fall) were found in Cajamarquilla (Villar Córdova Complex) (Vega 2015a).

Marsteller and Marcone (2012) presented a preliminary study on nine Middle-Late Lima children recovered in Lote B (Cerro Manchay, Lurín Valley), demonstrating a high prevalence of scurvy (56%) and early signs of tuberculosis (100%). Unfortunately, no differential diagnosis or photographs that allow one to corroborate their diagnoses were included in their article.

Studies of the osteological material of the second half of the MH period are restricted to the site of Ancón. Montoya (1994) studied the skeletons recovered in 1994 by Kauffmann's team, providing age, sex, long bone measurements, cephalic index, and some isolated paleopathological observations, stating that the individuals did not present fractures or "grave lesions".

Rojas-Sepúlveda and Dutour (2009) made a paleoepidemiological reconstruction based on 121 MH individuals of Ancón. Among their most relevant findings are the high prevalence of degenerative joint disease (76.5%), followed by non-specific infections (36%), trauma (13%), and porotic hyperostosis (7%). Cranial trauma was only present on two female adults (~3.1%) and two male adults (~4.1%). Fractures on females were located on the left frontal bone, while one male case was found in the frontal bone (close to the right orbit) and the other in the nasal bones.

Nicole Slovak (2007) produced a doctoral dissertation using 35 individuals of the Middle Horizon (divided into "early" and "late" MH). She found a prevalence of 63% of porotic hyperostosis/cribra orbitalia, 83% of dental caries and 36.4% of males with external auditory exostoses. Seventy-seven percent of the individuals showed cranial modification (all of them, of what she called the "coastal types") in the latest part of the MH, as opposed to the 0% exhibited in the early Middle Horizon. Slovak (2007) concluded that the people of Ancón identified themselves more as coastal populations and that the Wari influence was declining at the site. Her work also included isotopic analysis, finding that only one young female from the Wari heartland may have been present in Ancón (Slovak et al. 2009), and that during the early MH people had a mixed diet, which was replaced by a higher dependence on maize during the late MH (Slovak and Paytan 2011).

The virtual absence of people from the Wari heartland in Ancón was also corroborated by Pink's (2013) analysis of cranial non-metric traits, which did not find a close relationship between Ancón and other MH populations. According to Pink, the presence of Wari objects in Ancón, but not of people with close genetic ties to the Wari heartland, are a reflection of Schreiber's (1992) mosaic model for the Wari Empire (Pink 2013:154)[52].

3.2.6 Late Intermediate Period

In contrast with previous time periods, our understanding of the LIP and the Late Horizon is enriched by the contribution of written records left by Spanish and indigenous chroniclers in the 15th and 16th centuries. According to some of these ethnohistoric sources, during this period the Lurín and the Rímac Valleys were ruled by the Ychsmas, and the Chillón Valley by the Collis (for a more detailed description see Espinoza 1964, 1983, 1984; and Rostworoskski 1972, 1977, 1978, 1989, 1992)[53].

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[52] Schreiber's mosaic model implies that the Empire did not leave strong archaeological evidence in regions with a pre-existing infrastructure (Schreiber 1992).

[53] Colonial chronicles provide information about two nations speaking two different languages in the Chillón Valley, one from Carabayllo to the north and the other from Carabayllo to the south (Cobo 1956 [1639]). This information seems to have an archaeological correlation, since two different ceramic traditions have been recognized in Chillón: Ancón and the northern part of the valley, showing Chancay filiations; and the southern part of the valley, with a pottery style shared with the Rímac Valley (Patterson and Lanning 1964).

Ethnohistoric documentation gathered by Rostworowski established the existence of the *Señorío* Ychsma, which ruled the lands between the mouth of the Rímac and Lurín Rivers and the *chaupiyunga* or middle valley[54]. The Rímac Valley was organized in small *curacazgos*: Lati (Ate-Vitarte and La Molina), Sulco (Santiago de Surco, Surquillo, Miraflores, Barranco, and Chorrillos), Guatca (El Agustino, La Victoria, San Borja, San Luis, Jesús María, Lince, and San Isidro), Lima (Cercado, Breña, Pueblo Libre, Magdalena), Maranga or Malanca (the area surrounding the PUCP and UNMSM campuses, in San Miguel), Amancaes (Rímac), and Callao or La Lengua. The Lurín Valley was divided into *ayllus*: Pachacamac (from the monumental site to the actual town of the same name), Manchay (from the actual town of Pachacamac to Cieneguilla), Caringa (in the periphery of the Lurín Valley, to the *lomas* de Caringa in Chilca, to the south), and Quilcaycuna (between the littoral and the actual town of Lurín). These polities were governed by a lord or *curaca*, who controlled the land through an irrigation system with water intakes located in the middle valleys (Eeckhout 2004a; Rostworowski 1978) (Figure 3.3).

Recent archaeological evidence suggests that the Ychsma territory extended from the lower parts of the Rímac to the lower Mala Valley, with a nuclear area in Pachacamac and Lurín, and two peripheral zones: the Rímac Valley, and the central-south coast (Chilca-Mala Valleys) (Díaz 2008), the latter serving as enclaves or islands of the Ychsmas (Tantaleán 2008).

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[54] The Ychsmas shared the *chaupiyunga* with the Yauyos from the adjacent highlands, which descended to the lower land, settling in the middle Rímac Valley (Cerro Pariachi, Carapongo, Huampaní, and Huachipa), as was reported by Francisco de Ávila in his chronicle (Rostworowski 1978).

Figure 3.3: Approximate Location of the *Curacazgos* and *Ayllus* of the Rímac and Lurín Valleys (as described by Eeckhout 2004a and Rostworoswski 1978). Map by Fiorella Rojas

In essence, the Ychsma culture is archaeologically defined by the presence of a special kind of monumental architecture known as "pyramid with ramp"[55] and by a specific ceramic style.[56] Vallejo (2008) postulated that the disappearance of ceramic polychromy

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55 The pyramids with ramps share some features such as a terraced platform and a ramp, but also present some differences in their design, that allow them to be separated in three types (Eeckhout 2003:170, 2004a:405). They are basically found in the Lurín and Rímac Valleys (although some are found in Chanchay too), and had an economic and ritual function led by the elite (see for example, Bazán 1990; Bueno 1974-1975, 1977, 1982; Dolorier 1999; Eeckhout 1995, 1999a, 1999-2000, 2003, 2004a; Farfán 2004; Franco 1998, 2004; Jiménez Borja 1985; Jiménez Borja and Bueno 1970; Paredes 1988; Paredes and Franco 1987; Shimada 1991).

56 The pottery for this period has been described as modeled vessels, with simple and basic treatment and decoration (Vallejo 2004; Silva 1992:71).

during the Early Ychsma phase[57] probably reflected the isolation of the Ychsmas with respect to other groups, perhaps due to their internal social changes motivated by the disintegration in smaller *curacazgos,* the pressure of other groups, and the environmental desertification related to a relatively long period of lack of precipitation in the highlands[58]. According to the same author, during the Middle and Late Ychsma phases, the new changes in ceramic style coincided with the development of a more complex society. This isolation is also noted in the scarcity of foreign products at Armatambo (Díaz 2004).

Some earlier ceremonial mounds were reused as cemeteries, such as Huaca 33 of the Maranga Complex (Venegas and Sánchez 2014) and Huaca Túpac Amaru B (Rodríguez 1999), in the lower Rímac Valley. According to Flores (2005), the elite Wari funerary bundles of Huaca Pucllana were removed by the local population and replaced by simple Ychsma burials. During this time, changes in settlement patterns were detected in the middle Rímac Valley. The largest centres, which were located in previous times in the valley bottom and close to the base of the surrounding hills, moved to the top and sides of the hills. This could be related to the need for more crop area and for a safer area of living, seeking protection from natural disasters (e.g. mudflows) and potential attacks. Monumental sites were replaced by simpler constructions (Silva 1992).

By that time Pachacamac apparently became an important pilgrimage centre, indicated by various lines of evidence (e.g. the presence of temporal architecture, renovation of ritual structures, and the placements of thousands of offerings associated with temporal occupations by different social groups) dating from the end of the Middle Horizon (A.D. ~900-1000) to the arrival of the Inca to the central coast (circa 1460). This evidence was documented by Shimada and colleagues (2010) in the Plaza de los Peregrinos. Similarly,

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[57] The origin of the Ychsma style is still being debated. While some established an origin at the end of the Middle Horizon (e.g. Bazán 1990; Eeckhout 1999a; Vallejo 2004), other position stated that the end of the Wari period was immediately followed by the Early Ychsma and Three-Color Geometric styles, sometime between the MH 3 and 4 (Guerrero 2004; Narváez 2013).

[58] Thompson and collaborators (1985) stated that a severe dry period occurred between A.D. 1250 and 1310.

a funerary structure was found in the front of the Painted Temple that contained 34 individuals who demonstrated a variety of geographic and ethnic origins (based on isotopic, mtDNA, and ceramic analyses). This tomb had a long use which started in the early Ychsma period and finished during the early Inca occupation. No evidence of violent death was found (Takigami et al. 2014).

Some investigators stated that the Ychsmas evolved in a theocratic society governed by the priest of the Ychsma-Pachacamac cult, with the pyramids with ramp functioning as "embassies" (e.g. Franco 2004; Jiménez Borja 1985; Paredes 1988). However, using both archaeological and ethnohistoric data, Eeckhout (2008) concluded that the *curacas* – living in the pyramids with ramps / palaces – were the holders of the power, at least in the Lurín Valley. It is possible that the Ychsma *curacazgo* was a chiefdom formed by hierarchical linages (with a leadership of at least three levels, with the centre at Pachacamac) who governed territorial units (related to the hydraulic irrigation systems) that were organized by principles of duality and bipartition (Anan and Hurin Ychsma) (Conlee et al. 2004; Eeckhout 2003, 2008; Narváez 2013).

Bioarchaeological Research

Based on a preliminary study on 11 of the 189 skeletons recovered by Díaz, Aguayo (2008) reported the presence of antemortem and perimortem fractures in different individuals that made the author conclude that this population (especially females) suffered episodes of extreme violence. Unfortunately, the sampling, the inadequacy of the methodology, and some controversial diagnoses, cast doubts on her findings.

Chan (2011) analyzed 56 individuals from the Héroes del Pacífico cemetery, rescued by Maritza Perez in 1997. These individuals belong to the first half of the LIP and precede the individuals from the 11 de Octubre cemetery (Luisa Díaz, personal communication 2015). Chan found cranial fractures in 20% of the females and 36% of the males, including sharp and blunt force trauma. Based on his analysis of arthritic changes, trauma, and age at death, he concluded that males and females had homogenous lives, and child health was worse, and adult physical activities were higher relative to other Wari populations.

An analysis of the Ancón material showed that the site may have experienced elevated levels of gene flow during the LIP (Bethard 2013:171), based on craniometrics data recorded by Ross and colleagues (2008:159).

3.2.7 Late Horizon Period

Several authors have emphasized that the Incas used different strategies to conquer territories (i.e. military force, negotiation, and alliance), depending on the type of organization and economic worth that each society exhibited before being annexed by the Empire (D'Altroy 1992; Hyslop 1990; Malpass 1993). On the coast, the Incas established redistribution and tax relationships with the elites (Covey 2000; Morris and Covey 2006). In some cases the strategy implied the construction of provincial centres, as was done in the south coast in Inkawasi and Tambo Colorado, and Lima la Vieja (D'Altroy and Scheiber 2004:268-269; Hyslop 1985), where, as some ethnohistoric sources indicate, there was a good relationship between the Chincha lord and the Inca (D'Altroy and Scheiber 2004:269), and the Incas did not find much resistance in conquering the Nazca and Ica Valleys (Conlee et al. 2004:226; Menzel 1959). In other cases, the Inca just added new structures in the pre-Inca centres, such as La Centinela in Chincha, and Pachacamac in Lurín (Morris 1998; Shimada 1991; Shimada et al. 2010).

The central coast, specifically the Lurín Valley, attracted the attention of the Incas because of the prestige of Pachacamac as an oracle, and because they intended to control the cultivation of coca in the *chaupiyunga* (midvalley) (Cornejo 2000; Feltham 1984, 2005; López-Hurtado 2007, Marcone 2010; Rostworoswki 1977, 1989, 1999). Around A.D. 1470, Tupac Yupanqui, the Inca emperor, conquered the Rímac and Lurín Valleys (Brundage 1963). After the conquest of the Ychsmas, the Inca annexed the Collis (who had been militarily defeated by the Inca), forming the Inca province of Pachacamac (Cornejo 2000; Rostworowski 1989). Cobo (1964[1653]) informs us that the Pachacamac province was formed by three administrative units, whose capitals were Caraguayllo, Maranga, and Surco.

The Inca Empire's impact on the central coast can be seen through the changes in settlement patterns, architecture, burial patterns, the presence of the Inca road system, the relocation of population (*mitmas*), the abandonment of previous public buildings, the introduction of Imperial or imitation of Imperial Inca ceramic style, the transformation of local ceramic styles, and the increased presence of groups from the highlands in the highlands-coast border (Díaz and Vallejo 2002b, 2004; Eeckhout 1999a, 2004a, 2004b; Feltham 1984, 2005; Feltham and Eeckhout 2004; Guerrero 2004; López-Hurtado and Nesbitt 2010; Makowski and Vega Centeno 2004; Marcone 2004, 2010; Marcone and López-Hurtado 2002; Sánchez 2000; Vallejo 2004).

Although the Inca built new structures in many pre-existing sites, some of the Ychsma architecture was also remodeled to established administrative centres in important sites such as Pachacamac (Eeckhout 2004b), Huaca Tres Palos (Hernández and Oré 2011), and Armatambo (Díaz 2004; Díaz and Vallejo 2002b). The abandonment of the pyramid with ramps in Pachacamac, something that did not happen in other peripheral Ychsma sites (e.g. Huaycán and Pampa de las Flores), could imply that the local secondary authorities maintained (or even extended) their power under a strict Inca control (Eeckhout 2004a, 2004b). The continuity in the use of the pyramids with ramp during the Late Horizon was also noted by Díaz (2004) in Armatambo. This same continuity of local architecture, along with the introduction of new Inca elements was found in other parts of the Rímac area (Villacorta 2003, 2004a). However, new settlements were also created in the area during the time of Inca control, such as Pueblo Viejo-Pucará, a Caringa settlement close to Pachacamac, possibly built as a defensive and control site (Makowski 2002a; Makowski and Vega Centeno 2004).

Some of the large Lima and Ychsma ceremonial mounds were reused during the Inca time as cemeteries, as was seen in Huaca Trujillo (Silva 1992), and Huaca La Luz (Hernández and Oré 2011). The analysis of funerary costumes and architecture in the sites of Armatambo and La Rinconada (Rímac Valley) led Díaz (2004) to conclude that the incorporation of the new cultural elements was gradual, and coincided with the intensification of the presence of foreign objects.

The *mitmas* system (movement of artisans and workers from one province to another) was used to diminish the power of the local polities, in this case, the Ychsma (Cornejo

2000; Rostworowski 1978). This practice was corroborated archaeologically by Cornejo (1999, 2002, 2004), who found four groups of burials of Huaca Santa Cruz (Rímac Valley), that differ from each other by their different orientation and ceramic styles. Based on preliminary analysis of funerary contexts from the central coast, Cornejo (1999, 2002) also identified 16 occupational categories that were distributed in four social groups:

a) Social group I: Local and foreign *aqllas* (females, usually between 18-20 years, in the serving of the Inca).

b) Social group II: *Orejones* from Cuzco, and local or foreign *curacas* and priest

c) Social group III: *Mitmas* and local artisans. This category includes soldiers[59], *quipucamayocs* (record keepers), traders, and musicians.

d) Social group IV: local farmers and fishermen

The Incas subtly imposed their cult, respecting in a manner the local beliefs that they partially shared (Eeckhout 2004b). The chronicler Garcilaso (2005 [1609]:394-397) referred that the negotiation between Tupac Yupanqui and the main *curaca* ended peacefully. However, there is also information for different rebellions in the region. Ethnohistoric data gathered by Rostworowski (1989) provides information on the 12 years of rebellions in the southern region (Calango, Alancuna, and Chaqui areas), that were put down by Yauyos troops from Huarochirí (high Lurín Valley). Other Yauyos groups (including the Chacllas) invaded the middle Lurín and Rímac Valleys, and the northern Rímac margin and the entire Chillón Valley. Consequently, the Inca introduced the *guarangas* system in these problematic areas, ordering the Chacllas to conquer the Chillón Valley. In addition to this, the evidence of burnt structures in the site of Panquilma (middle Lurín Valley) made López-Hurtado and Nesbitt (2010) conclude the site was abruptly abandoned.

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59 Soldiers could also present offerings of the social group II (Cornejo 1999:415) and farmers offerings from the group III (Cornejo 2002:Table 1).

In 1535, the Spaniards (who arrived in 1532 on what would eventually become Peruvian territory) founded Lima in the lower Rímac Valley, establishing it as the capital of the conquered territories. The first decades of the Spanish invasion saw the abandonment of many important sites such as Pachacamac, and the drop of the local population by 90%. Many died as the direct and indirect consequences of the conquest, and the remaining indigenous population were reorganized following the new political order imposed by the Spanish *conquistadores* (Rostworowski 1992).

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Osteological analysis carried out in different sites such as Puruchuco-Huaquerones, La Rinconada, Pampa de las Flores, Malanche 22, and the Maranga Complex showed the presence of non-specific stress indicators, but low prevalence of trauma (especially of interpersonal origin) (Boza 2010; del Carpio and Vega 2011; Eeckhout 1999a; Mujica et al. 1992; Murphy 2004; Salter-Pedersen 2011a; Williams and Murphy 2013). Murphy (2004) also reported some probable cases of treponematosis and tuberculosis the site of Puruchuco-Huaquerones. None of these studies offered conclusions about the impact that the Inca State had over the Ychsma population, as they did not compare their findings with studies on LIP samples from the same area. Only Boza (2010) stated that the presence of the Inca Empire did not negatively affect the health of the people of the central coast, and that the annexation of the Ychsma to the Inca state was peaceful. However, the limited number of individuals in her sample (n=15) makes these statements very risky.

Some of these studies also provided insights about the social composition and diet of the Ychsma. For example, Salter-Pedersen's (2011a) biological distance analysis of cranial metric and non-metric traits did not show the presence of a multi-ethnic society among skilled artisans buried in the cemetery of Rinconada, who seemed to have a coastal origin. Murphy's (2004) dissertation did not find any statistical difference in the morbility between different social status groups. An isotopic analysis done by Williams (2005) concluded that the diet in Puruchuco-Huaquerones consisted primarily of maize and lower trophic level animals (e.g. guinea pigs and camelids), but C_3 resources (e.g.

tubers) were consumed during winters. Males had more access to maize (probably consumed as *chicha* beer) and animal protein than females. Elite males had more access to marine products in their diets compared to females and non-elite males (see also Williams and Murphy 2013).

Two independent studies have demonstrated the elevated prevalence of perimortem trauma in “atypical” burials of Puruchuco-Huaquerones that undoubtedly links them to an encounter with European weapons (see Lund 2009; and Murphy et al. 2010, 2011). Murphy and colleagues found 37.7% of perimortem trauma among “atypical” individuals (15 year olds and older, all of them from the 57AS03 cemetery) and 9.3% of “Late Horizon” individuals from the 57AS03 cemetery (14.2% combined with Huaquerones), with males being more affected than females (although and exact prevalence by sex was not provided) (Murphy et al. 2011:63-64). Children also exhibited high rates of perimortem trauma (Gaither 2012; Gaither and Murphy 2012). Gaither (2012) detected an increase in the prevalence of what she called “extreme cultural conflict” violence, but not of “likely caregiver-induced violence” during the early post-contact period among subadults from the Puruchuco-Huaquerones cemetery.

3.2.8 Summary

As we can see through this brief account, the cultural history of the Peruvian central coast was marked by a complex sequence of events. The chronology of the central coast is characterized by a slow development from simple, egalitarian, nomadic groups (Preceramic period); followed by the formation of chiefdoms (Initial and Early Horizon periods), the emerge of social stratification (EIP A), the rise of the Lima culture (EIP B) and possibly the consolidations of the first state during the Late Lima period (MH 1). After the expansion and fall of the Wari Empire (MH 2-4), the central coast societies split again into independent polities that eventually coalesced into a complex society: the Ychsma (LIP), until the expansion of the Inca Empire (LH), which ended with the arrival of the Spanish conquerors. Some of these socio-political changes could have been caused by dramatic climatic changes (possibly related to Mega El Niño events), such as the severe droughts at the end of the Middle Lima period and during the LIP, and the mudflows during the transition to beginnings of the MH.

3.3 Evidence of Pre-Hispanic Violence on the Central Coast

This section is a synthesis of the published material to lay the ground work from which I will expand on the remainder of this study.

3.3.1 Preceramic /Archaic Period

No defensive architecture has been found for the Preceramic/Archaic Period (Arkush and Tung 2013). Some individuals of Chilca Pueblo I were buried with possible spear-throwers, darts, and stone points (Engel 1988), and some projectile points were found at Paloma (Engel 1980; Quilter 1989). However, no evidence of violence was found on human remains from Paloma, suggesting that interpersonal and intercommunal violence was relatively low in this period (Benfer 1984; Quilter 1989). It is also possible that the weapons found at the site were used only for animal hunting.

3.3.2 Initial/Early-Middle Formative Period

The only bioarchaeological information available for these periods comes from the site of Cardal. One out of ten male crania (10%) presented a compressed antemortem fracture. Conversely, none of the eight female crania exhibited any sign of trauma (Vradenburg 2001:Table 24).

3.3.3 Early Horizon/Middle and Late Formative Period

Patterson's and Lanning's (1964) survey of the Chillón Valley showed the presence of a significant number of habitation sites in the hilltops during the EH, and at least one showed evidence of fortification, suggesting increased military activities. In the site of Huaca Grande in the lower Omas Valley, Engel (1987:90) found a small polished club associated with an adult skeleton.

3.3.4 Early Intermediate Period

For the beginning of the EIP, Vradenburg found circular compressed fractures in the cranium (especially affecting the left side) of some individuals of Tablada de Lurín and Villa El Salvador (in this site, including a perimortem fracture), that were consistent with mace head injuries and face-to-face confrontations (Vradenburg 2001:159-160) (Table 3.2). In a similar manner, Altamirano and Jave (2013:133) reported circular depressed skull fractures and parry fractures at the site of Cerro Punta Blanca. Unfortunately, they did not provide the prevalence of these injuries.

Table 3.2: Prevalence of Cranial Fractures in Sites from the Beginning of the EIP

.	Males	Females	Adults Combined
Tablada de Lurín (Vradenburg 2001:Table 24)	9% (1/11)	10% (1/10)	10% (2/21)
Villa El Salvador (Vradenburg 2001:Table 24)	53% (10/19)	6% (1/17)	31% (11/36)
Villa El Salvador (Pechenkina and Delgado 2006:Table 2)	20% (6/30)	10% (3/31)	15% (9/61)

Metal and stone heads of maces were found in tombs of the lower Lurín Valley, such as Tablada de Lurín (Cárdenas 1999; Makowski 2002b, 2009a), El Panel (Maguiña and Paredes 2009; Paredes 1984), Limay (Cárdenas 1999), and Villa El Salvador (Stothert and Ravines 1977); and in Huachipa and the site of Cuncacucho in the middle Rímac Valley (Palacios 1988, 2013). This last site also presented sling stones and defensive architecture on the top of the hill, possibly a reflection of a period of confrontations (Palacios 2013). The presence of these artifacts, and fortified sites on the tops of some hills of the Lurín Valley led Stothert and Ravines (1977) to conclude that violence was present in the valley during this time period. Hilltop settlements were possibly present in the Chillón Valley, such as the site of Pro (Agurto 1984; Guzmán 2007; Silva 1996).

Earle (1972) registered possible defensive settlements in the crest of hill-ridges of the middle Lurín Valley associated to Early Lima (Lima 1) and Middle Lima (Lima 4 and 5) ceramics, in contrast to the site of Lima 2, 3, and 6 (located mainly in the *quebrada* floors and in the lower slopes) leading him to posit the presence of "endemic warfare" in Lima 1, 4, and 5. In contrast, during the EIP, the Chillón Valley was characterized by non-defensive sites (e.g. Paredes 2000; and Silva 1996).

The Lima Period presented (at least in its latest phase) cases of human sacrifices, (e.g. Barreto 2011, 2012; Flores 2005) and ritual manipulation of human heads (see Stumer 1953), although these are not as common as in their northern and southern neighbours (the Moche and the Nazca). These practices could have an iconographic parallel in some mural paintings found in Cerro Culebra (Figure 3.4) (Paredes 1999; Stumer 1954), although this interpretation has been questioned (e.g. Escobar and Goldhausen 1999). Other indirect evidence of violence in this period includes five slings and a broken circular stone mace head found in the Maranga Complex by Jijón and Caamaño (1949) and some metallic star maces found in Huachipa (Palacios 2013).

Figure 3.4: Mural Painting in Cerro Culebra possibly showing trophy heads (after Engel 1987:Figure III-8a)

3.3.5 Middle Horizon Period

During this period, the Chillón Valley presented mostly non-defensive sites (Silva 1996). A stone arrow point was found in a Nievería context at Potrero Tenorio, in the right margin of the middle Rímac Valley (Palacios and Guerrero 1992). Among the objects found by Uhle in the cemetery of Nievería (north bank of the middle Rímac Valley), Gayton (1927) reported the presence of two spear throwers. Likewise, an isolated stone mace head was found in an architectural fill of the domestic site of Huaca 20 (Maranga

Complex) (Mauricio 2012), and in a burial of a male of the Ancón cemetery (Kauffmann 1994). Another male individual from Ancón presented a spear-thrower (Ravines 1977).

Trophy heads were found in Pirámide 21 of the Maranga Complex, which contains tombs associated to Late Lima and Nievería ceramics (Jijón y Caamaño 1933, 1949; Paredes 1998, 1999) while rituals involving human sacrifices (mostly of young females) were performed in Huaca Pucllana (e.g. Barreto 2011, 2012; Flores 2005) and Pachacamac (Kaulicke 2000). Evidence of perimortem trauma was found in one child and a young woman at the Maranga Complex, possibly related to ritual ceremonies in the construction or closure of architectural spaces (Barreto 2014).

In Wari funerary contexts of Huaca Pucllana, Barreto (2011, 2012, 2013b) also found evidence of perimortem trauma both related to interpersonal violence and sacrifices of females and children. Different reports and Barreto's thesis present skull fracture data that I have reinterpreted, presented here in Table 3.3.

Table 3.3: Prevalence of Antemortem Cranial Fractures in MH Sites

.	Males	Females	Subadults
Cajamarquilla (Fierro c.1998)*	0% (0/3)	33.3% (1/3)	0% (0/1)
Huaca Pucllana (Barreto 2012)	25% (3/12)	5% (1/20)	0% (0/8)
Catalina Huanca (Álvarez 2013)	27.3% (3/11)	20% (1/5)	0% (0/15)
Ancón (Rojas-Sepúlveda and Dutour 2009)	~4.1 (2/48-50)	~3.1 (2/63-65)	-

*internal report given by Juan Mogrovejo, project director

Álvarez (2013:Tables 14 and 15) also reported blunt force perimortem trauma to the vault of 2 of 15 subadults (13.3%) and in 3 of 12 adult males (25%). None of the six females presented this kind of fractures. No cases of perimortem trauma were found in

Cajamarquilla. Likewise, Rojas-Sepúlveda and Dutour (2009:Table VII) found antemortem cranial fractures in two males and two females from Ancón, all of them affecting the anterior part of the skull.

An engraved gourd representing two scenes of fighting men was found among the refuse that sealed a Lima passage in Huaca San Marcos (Shady and Narváez 1999, 2000). One of them shows two apparently weaponless men punching each other (one of them also kicking and holding a trophy head) while the other showed two armed men (possibly holding an axe or mace) kicking one another (Figure 3.5).

A large number of burials that included weapons were found in the MH 2-4 deposits at Ancón (Kaulicke 1997).

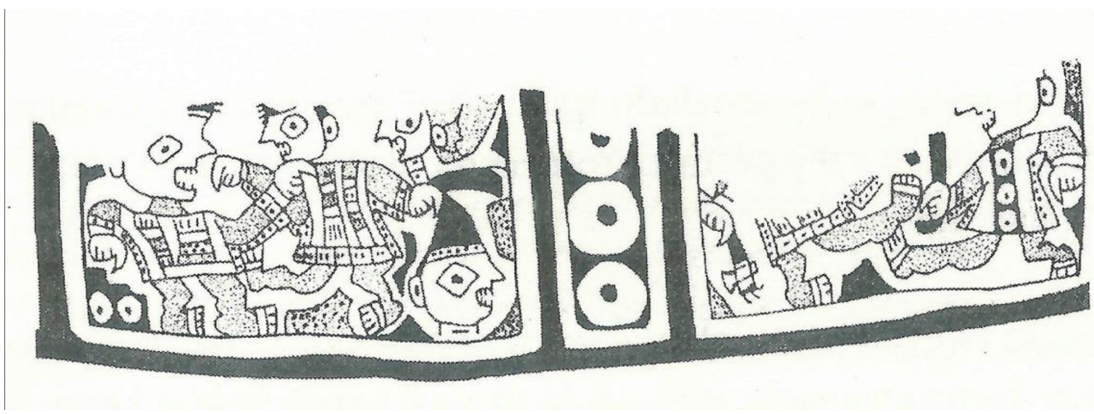

Figure 3.5: Representation of Fights Engraved in a Gourd of Huaca San Marcos (Wari Period) (Based on Shady and Narváez 2000:24).

3.3.6 Late Intermediate Period

Possible fortresses are found in the site Fortaleza de Collique[60], thought to be the capital city of the Collis, and located in the top of a hill in the Collique area (Chillón Valley) (Agurto 1984; Guzmán 2007). Likewise, near the mouth of the Chillón River, there is a

[60] Although the chronology assigned to the site covers from the EIP to the LH, the defensive walls were built in the LIP. Sling stones were also found in the site (Correa 1992).

group of tall walls enclosing an area of 635 ha that probably had a defensive function (Agurto 1984:135). According to Silva (1996), many sites of the Chillón Valley (especially in its northern part) were fortified.

The head of a stone mace and a possible sling stone were found in a small adobe box (possibly as part of a ceramic offering) in the Plaza de los Peregrinos at Pachacamac (Shimada et al. 2004:531). A sculptural vessel that shows a human figure with hands and feet tied behind their back (possibly representing a prisoner) was found in Armatambo inside an adobe chamber containing the ritual burial of two wooden staves and six ceramic vessels. Next to the chamber laid an extended individual with tied ankles and thighs (Díaz 2004:588-589).

In Huaca 33 (Maranga Complex), 48 funerary contexts containing a MNI of 134 was found. The majority of the individuals were wearing only a loincloth or a tunic, or were wrapped in a single textile; however, some were apparently naked and thrown in different positions. Of this last group, many were young adults with perimortem fractures in the skull, ribs or long bones, and they possibly correspond to a warlike event that was also associated with the sacrifice of 62 dogs (Venegas and Sánchez 2014:157). Barreto (2014) analyzed 26 of these individuals (15 males, 9 females and 2 undetermined). Almost one quarter of them were individuals between 5 and 20 years old. Younger individuals were underrepresented. Perimortem trauma was found in 58% (15/26) of the individuals. The majority of these lesions were blunt force trauma to the skull. However, there were also cuts in the neck, puncture wounds and blunt trauma to the thorax, and antemortem fractures (close to the time of death and consolidated) in the ribs. Other pathologies and modifications included occupational and nutritional stress, old fractures in long bones, some possible cases of treponematosis, auditory exostoses, femoral epiphysiolysis, dental pathologies, skull modification, and a possibly case of skull trephination. Only 21% of the individuals did not present any pathology. The author stated that these individuals experienced difficult living conditions and were victims of interpersonal violence that could include punitive actions or a larger scale conflict (ref).

Unfortunately, the exact chronological affiliation of the remains is uncertain. Some remains were associated to Late Ychsma ceramics from the end of the LIP and the LH (Narváez 2014). Although no Inca ceramics were found in the site, the assignment of these contexts to the LH (or even to the Early Colonial period) cannot be ruled out.

Antemortem and perimortem, malintent traumatic lesions were also found in three cemeteries of Armatambo (Aguayo 2008; Chan 2011; Vega 2003). Chan (2011:Table 8) observed cranial fractures in 36% of the male adults (4/11) and 20% of the female adults (3 out of 15). Sharp force trauma was evident in 19% of the females (4/21) and 6% of the males (1/18). Only one of the examples of cranial trauma was a perimortem lesion, and it was present in an old female (Chan 2011:236). Vega (2003) observed a healed parry fracture in a female adult. The individuals that Aguayo (2008) analysed are part of the sample of the present doctoral research.

Table 3.4: Prevalence of Cranial Fractures in LIP Sites

<table>
<tr><th></th><th>Males</th><th>Females</th><th>Subadults</th></tr>
<tr><td>Armatambo-11 de Octubre (Aguayo 2008)</td><td colspan="2">22.2% (2/9)</td><td>0% (0/2)</td></tr>
<tr><td>Armatambo-Héroes del Pacífico (Chan 2011)</td><td>36.4% (4/11)</td><td>20% (3/15)</td><td>?</td></tr>
<tr><td>Armatambo (Vega 2013)</td><td>-</td><td>0% (0/3)</td><td>0% (0/5)</td></tr>
</table>

3.3.7 Late Horizon Period

Possible cases of sacrifice of infants and adults (especially females) have been documented in Pachacamac and Pampa de las Flores (Eeckhout 1999b; Eeckhout and Owens 2008; Fleming 1987; Uhle 1991 [1903]).

The Inca army used different blunt and sharp weapons, and some projectile throwers such as the *huaraca* (sling, the preferred weapon), *champi* and *coyota* (metal or stone star maces), *cuncacuchuna* and *ayri* (stone and metal axes), *chuqui* (spears of wooden or metal point) *huino* (wooden sword), *uchuichuqui* and *cumana* (dart and spearthrower) stood[61]. Bows and arrows and bone daggers were extremely rare. Defensive gear such as helmets, armors, and shields was also employed (Galimberti 1951; López 1980; Mayer 1998; Vega 1991). Examples of these weapons were found at different sites of the central coast, such as sling stones, axes and maces at Pueblo Viejo-Pucará (Barraza and Vega 2011; Makowski 2002a), maces, a copper axe, slings and a copper knife at Pachacamac (Squier 1967 [1869]; Wiener 1993 [1880]), a copper knife (*tumi*) and slings at Rinconada Alta (Frame et al. 2004:858), slings at Puruchuco-Huaquerones (Cock and Goycochea 2004:187), and a fragment of a head of stone star mace and possible sling stones in Canto Chico (Ravines 2000:282). *Boleadoras* (a throwing weapon) of San Juan de Pariachi and a mold of the head of a star mace of Huaquerones are part of the collection of the Puruchuco Site Museum (Vetter 2004; Vetter and Villacorta 2001), and probably belong to the Inca period. Another collection of maces, possibly from this period, was found at Huaca San Miguel of the Maranga complex (Silva 2014:198). In contrast, sites with clear defensive functions have not been identified (see for example, Feltham 1984; and Silva 1996).

The analysis of human remains from the Inca period in the central coast has been quite extensive. There is information for three sites of the Lurín Valley: Pampa de Las Flores, Malanche 22, and Pachacamac. Elsa Tomasto (see Eeckhout 1999a:343-345) analyzed 189 individuals from a surface collection of the site of Pampa de las Flores. She found cases of trauma, especially in the crania. She also reported one case of a parry fracture. In Malanche 22, a Caringa settlement in the Malanche *lomas* (between Lurín and Chilca), Mujica and colleagues (1992) excavated a tomb containing the remains of 11 individuals (four infants, three early children, two young females, one middle adult female, and a young male)[62]. A young female presented a blunt force fracture (possibly made by a

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[61] Some of these weapons have an older origin (i.e. slings, spearthrowers and maces), as was seen in the account provided for the previous time periods.

[62] Although the authors proposed that the context belonged to the LIP (based on the absence of Inca ceramics), the similarities with the Pueblo Viejo-Pucará architecture and burials (which did not present Inca

mace) in the process of healing in left-upper part the frontal bone. In the site of Pachacamac, Eeckhout and Owens (2008) reported antemortem cranial trauma in approximately 13% (13?/103) of the adults.

There are also publications and reports of individuals from the Rímac Valley. In Rinconada Alta, a primary low-class, non-Inca artisan population, Salter-Pedersen (2011a and b) calculated a trauma prevalence of 51.6% (especially antemortem rib fractures and Schmorl's nodes), with males being more affected than other segments of the sample, and adolescent showing higher rates of perimortem trauma. Salter-Pedersen concluded that falls were the most likely explanation for most of the lesions, although violence was probably also present (both interpersonal and warfare). A soldier with a perimortem traumatic lesion in the neck (possibly due to a fall) was found in the same site (Frame et al. 2004:859).

Antemortem and perimortem traumatic lesions were reported by Murphy (2004) for the site of Puruchuco-Huaquerones. She did not find differences in the frequencies of cranial fractures between different social status groups. Some of the perimortem trauma could have been produced by a mace.

Ravines (2000:132) noted the scarcity of trauma on individuals recovered in Canto Chico, only finding one case of healed fracture in an adult humerus. Nevertheless, it must be noted that the osteological collection of this site is incomplete, consisting only of a few bones of commingled individuals and only four complete skulls in a total of 12 tombs. I reported (Vega 2008) a healed parry fracture from the site of San Juan de Pariachi.

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vessels) indicate that Malanche 22 was probably a Caringa site of the Late Horizon period (Sergio Barraza, personal communication 2015).

Del Carpio and Vega (2011:112) reported the case of a male (30-40 yr) from Huaca Huantinamarca (Maranga Complex) presenting a healed parry fracture on the left forearm and multiple perimortem scoop defects on the left humerus. This kind of lesion is generally related to long-bladed weapons such as swords of machetes (Kimmerle and Baraybar 2008:279). The man, slightly taller and heavy-set, was probably a soldier who may have fought against the Spanish *conquistadores*. No cases of malintent trauma was found by Boza (2010) in her osteological analysis of individuals from the Maranga complex. Finally, Altamirano and colleagues (2006) reported 11 individuals with trauma from a collection of 241 Inca crania of the site of Makat-Tampu. A reinterpretation of the prevalences of cranial fractures from diverse Late Horizon sites is presented in Tables 3.4 and 3.5.

Table 3.5: Prevalence of Antemortem Cranial Fractures in LH Sites

	Males	Females	Subadults
Pampa de Las Flores (Eeckhout 1999a)	8.3% (4/48)	5.1% (4/79)	0% (0/62)
Malanche 22 (Baraybar 1999; Mujica et al. 1992)	0% (0/1)	33.3% (1/3)	0% (0/7)
Complejo Maranga (Boza 2010)	0% (0/5)	0% (0/7)	0% (0/3)
Rinconada (Salter-Pedersen 2011a)	10.4% (5/48)*	5% (2/40)*	0% (0/6?)
Puruchuco-Huaquerones (Murphy 2004)	19.4% (14/72)*	8.6% (5/58)*	0% (0/60)
Pachacamac (Eeckhout and Owens 2008)	~12.6% (13?/103)		-

*Including adolescents

Table 3.6: Prevalence of Perimortem Cranial Fractures in LH Sites

.	Males	Females	Subadults
Pampa de Las Flores (Eeckhout 1999a)	0% (0/48)	0% (0/79)	0% (0/62)
Malanche 22 (Baraybar 1999; Mujica et al. 1992)	0% (0/1)	0% (0/3)	0% (0/7)
Complejo Maranga (Boza 2010)	0% (0/5)	0% (0/7)	0% (0/3)
Rinconada (Salter-Pedersen 2011a)	16.7% (8/48)*	0% (0/40)*	0% (0/6?)
Puruchuco-Huaquerones (Murphy 2004)	12.5% (9/72)*	6.9% (4/58)*	0% (0/60)

*Including adolescents

Finally, an interesting scene is represented in a Chimú-Inca sculptured bottle found in the pyramid with ramp Nº1 of Pachacamac (Ángeles 2011). It shows a man pressing what seems to be a stone to the back of the head of a female weaver, possibly representing how women were forced to work in textile production during the Inca period (Figures 3.6 a and b).

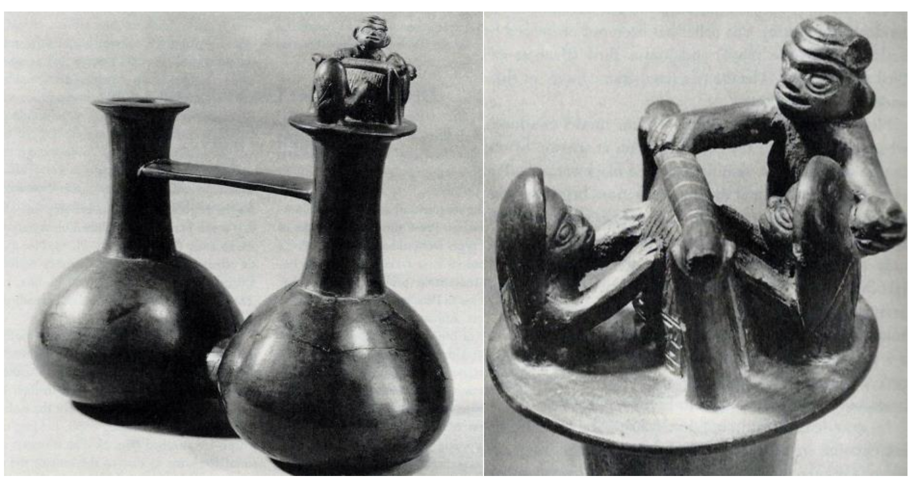

Figure 3.6 a and b: Chimú-Inca Sculptured Vessel Representing a Man Possibly Controlling the Textile Production (Vanstan 1979:Figures 1 and 2)

3.4 Violence in the Andes

The presence of violence in the Andean region has been recorded through different sources, such as archaeology, ethnohistory, and ethnography. Besides common interpersonal tensions, *ch'axwa* or limit feuds between *ayllus* (or in a larger scale), ritual battles, and wife battering are the major contexts in which violence take place in the Andes (Harris 1994:45). A brief summary of the latter three types of Andean violence is presented below.

3.4.1 Andean Warfare ("Real" and Ritual War)

Tristan Platt (1987:84) differentiated between *ch'axwa* or "cruel war" and *tinku*, defined by him as a *pujllay* or "game" (also named as "real war" and "ritual war" by Arkush and Stanish 2005). The former is performed in the inter-ethnic limits, in the land that is in dispute.

"Real" war in the Andes has been usually studied through the presence of defensive sites. Some investigators (e.g. Hyslop 1990; Morris 1998; Topic and Topic 1987), follow conservative criteria for considering a site as defensive (e.g. the presence of special architecture associated with weaponry). However, Arkush and Stanish (2005) proposed that, given the fact that even "true war" includes ritual components, ceremonial and defensive kinds of architecture are not "mutually exclusive", as was demonstrated by Iván Ghezzi (2006) at the Formative site of Chankillo (Casma Valley). In the same way, Arkush and Stanish (2005:16) suggested that if the war parties are small, "fortifications need not be mighty and impregnable or even continuous to be effective".

The earliest evidence for warfare in the Andes are the fortified sites of the Early Horizon in the north-central coast (e.g. Brown Vega 2008; Ikehara 2015, 2016; Pozorski 1987; Pozorski and Pozorski 1987; Proulx 1985; and Wilson 1987, 1988). However, warfare has been most convincingly identified among the Moche and Recuay of the Early Intermediate Period (north coast and north highlands respectively) based on multiple lines of evidences (e.g. the settlement patterns, defensive architecture, weaponry, iconography, and perimortem trauma) (e.g. Castillo 2014; Lau 2011, 2014; Topic and Topic 2009; Verano 2014a, 2014b). Bioarchaeological research by Tung (2007, 2012, 2014b) has identified evidence of warfare on some Wari and Wari-affiliated sites of the southern highlands. However, few fortified sites have been reported for the south and central highlands in the Wari period (Arkush and Tung 2013).

The Late Intermediate Period seemed to be a violent epoch in which different Andean societies waged war (or were threatened by it)[63] (e.g. Arkush 2009, 2014; Brown Vega 2008; Juengst et al. 2015; Kurin 2012, 2014; Nielsen 2009; Topic and Topic 2009; and Torres-Rouff et al. 2005)[64]. According to Arkush (2014:199), the settlement patterns during this time period strongly suggest that violent conflicts were common and not limited to the frontiers between *señoríos* (described by the Arkush as non-state segmentary organizations).

Warfare was used by the Inca as a strategy of conquest and to suppress rebellions (e.g. D'Altroy 1992, 2002; Ogburn 2014), and its presence has been demonstrated bioarchaeologically in the Cuzco region by a shift in the prevalence of perimortem trauma relative to the two previous time periods (Andrushko and Torres 2011). Based on the information contained in Spanish chronicles, Hyslop (1990:147) concluded that "young Inka males learned from experienced officers, initiation rites, and by participating in ritual battles."

The presence of females in the battlefield both as warriors and as companions was documented in the chronicles of Agustín de Zárate and Pedro Pizarro, and compiled by Penny Dransart (1987), providing an overview of the role that women could have had in war during Inca times. Women took active roles in violent encounters against the Spaniards in the Tiquina massacre (Thomson 2007) and using slings in the battle of Liribamba (Dransat 1987). However, as Dransart (1987:65) noted, if is not known if the presence of female as warriors was a common practice in the Andes, as slings are also a

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63 Guaman Poma (2008 [1615]) stated that the time period that preceded the Inka conquest was remembered as the time of the Auca Runa or warriors.

64 It is possible that the violence in this period was related to a severe period of drought that affected the Andean highlands (e.g. Arkush 2008; Covey 2008; Nielsen 2001, 2009).

useful tool in herding, an activity performed by both males and females; making females skillful slingers (although generally practicing in non-battle contexts). However, according to Dransart (1987) it is more likely that the female role during war was to participate in the rituals that took place during the battles, sometimes being taken as prisoners by the winners in the aftermaths of the battles. According to Cobo (1990 [1653]), women were captured during wars and divided among captains and important men.

Ritual warfare in the region has been documented both ethnographically and ethnohistorically (for the Inca period) (see for example Alecastre and Dumézil 1953; Gorbak et al. 1962; Hartmann 1971-1972; Hastorf 1993; Hopkins 1982; Platt 1987). In modern days, these kinds of battles are known by different names such as *tinku* (Bolivia), game of the *pucara* (Ecuador) and *Chiaraque* or *Tocto* (named after the communities of the southern Peruvian Andes in which the practice was documented). Human blood is spilled to ensure the fertility of the land, domestic animals, and people. There is also an emphasis on the separation into social groups, interchange, and land limits (e.g. Hopkins 1982). The fact that these battles are still performed today confirms the deep roots that these events had in the Andean region.

Diane Hopkins (1982) presented the description of a ritual battle which occurred in 1772 in the southern Peruvian highlands, and complemented this information with the data she gathered from Spanish chroniclers such as Cobo, de Molina, Gutiérrez, and Guaman Poma. She concluded that this kind of battle usually took place between December and March by two halves of a same community (*hanan*, or upper part; and *hurin*, the lower part), that fought each other to establish social and land limits. However, according to Hastorf (1993:54) the confronting groups could be two communities, two *barrios* (neighbourhoods) of the same village, two groups of the same *ayllu*, herder vs. agriculturists, or even males against females. Hartmann (1971-1972:133) found similarities between the ritual fights that are still in practice throughout the Andes, concluding that the ritual fights are organized and usually take place on fixed dates and places (and are related to a particular festival), between neighbouring groups or villages with the goal of producing injuries and kills to obtain better crops. *Tinkus* not only provided access to resources and political power, but they were also a strategy for social maintenance within groups that did not have a centralized political authority (Hastorf 1993:54).

The preferred weapon in ritual battles was the sling and stones (or sometimes with hard fruits such as prickly pears) (Gorbak et al. 1962; Harris 1994; Hopkins 1982). However, one-on-one fights involving knives, sticks, punches, and kicks (sometimes with gloves or shoes with attached stones or nails) have been also recorded (Cereceda 1978; Gorbak et al. 1962; Hartmann 1971-1972; Hopkins 1982)[65]. Even when fruits were used as projectiles, some people were severely hurt or even died from their injuries. In some cases, the dying combatants were buried on the battle field (see for example, Roca et al. 1966). Although young males are usually the active participants (and therefore, the injured or killed), some young females are also present during the battle[66]. Hopkins (1982:168) reported that a young woman died as a result of the fights in the battle of 1772. Young females are sometimes taken as captives to serve as concubines by the winning group (Alecastre and Dumézil 1953; Gorbak et al. 1962; Hastorf 1993).

However, the difference between a "real war" and a "ritual war" in the Andes is not a rigid separation, since both types of war are highly ritualized. Ethnographic and ethnohistoric investigations on Andean violence suggest that warfare in the Andes was surrounded by strong ceremonial rites previous to and during the battles (Arkush and Stanish 2005; Platt 1987; Topic and Topic 1997, 2009). Moreover, it seems that the modern meaning of *"ch'axwa"* of "cruel war" was not used during the 16th century, and that the word "*tinku*" did not appear in early colonial vocabularies. Thus, it is possible that the dichotomy "real war" and "ritual war" was created during the post-contact period (Hastorf 1993; Topic and Topic 1997, 2009).

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[65] There is also ethnographical records of *tinku* battles throwing water with special vessels (e.g. Rasnake 1989:162)

[66] In the Bolivian modern *tinkus*, unmarried girls fight against other girls, and their presence is considered essential for the success of the male warriors (Harris 1980; Platt 1987). However, the fights between them are limited to pulling each other's hair and tearing their clothes (Harris 1994).

3.4.2 Domestic Violence (IPV) and Child Abuse

Modern physical violence against women has been reported in different parts of Peru (e.g. Bardales 2012; Güezmes et al. 2002; Parra 2012). Diverse ethnographic studies have reported the presence of violence against women perpetrated both by husbands and mother-in-law. Except in cases of extreme violence, this behaviour is commonly accepted, even by the victims (e.g. Harris 1994, Parra 2012).

A recent epidemiological study on mental health in Lima and Callao showed that 87.3% of the women (married or living in common law) had suffered physical aggression by their partners, mainly by pushes (73.8%), slaps (62.7%), punches (46.9%), and kicks (33.3%) (Saavedra et al. 2012:Tables 80C and 81C). Of all the cases of domestic abuse reported to the authorities in Lima, 87.2% were declared simple blunt force injuries which only required a few days of medical rest (Santa Cruz 2010).

The presence of domestic violence in the Andes could have pre-Hispanic roots, judging from the testimonies of some Spanish chroniclers, as is inferred from this quote:

> "If a man had a wife who had been given to him by the Inca or his governors, or if he had won her in a war, or gotten her by other means considered legitimate among them, there was no way for her to break away from the authority of her husband, unless he died. Moreover, the women did not dare complain about any injury they may have received, except to their husbands." [Cobo 1979 [1653]:204, translation by Hamilton]

Child abuse is also present in the Andes, but has not been extensively recorded by ethnography. In the Northern Potosí, ethnographic work by Olivia Harris (1994:45) reported occasional cases of physical punishment of children. However, this was not seen as an acceptable method of punishment. However, Parra's (2012) ethnographic work in the central Peruvian Andes suggests that physical violence from father to children is common.

3.5 Expectations on the Rates of Violence in the Present Research

Based on the literature review presented in Chapter 2 and 3, I predict that the following patterns will appear. These predictions will guide the data collected, the methods of analysis and the interpretation of the results presented in this dissertation.

1. I expect that in until the Initial Period and Early Horizon, the prevalence of malintent trauma will be low, with isolated cases of non-lethal malintent trauma in males, resulting from occasional episodes of interpersonal violence.

2. I expect that the prevalence of non-lethal and lethal malintent trauma in males will rise in the beginnings of the Intermediate Period, related to the introduction of new ideologies, and the first evidence of social stratification. Some cases of malintent trauma in females and subadults will also appear, as a reflection of this turbulent time.

3. I expect that the prevalence of malintent trauma (mostly non-lethal) during the Middle Lima period will decrease as a consequence of the consolidation of the new social and political order.

4. I expect a new rise in the prevalence of both lethal and non-lethal malintent trauma among males, and probably among females (with isolated cases in children), early in the Middle Horizon, related to the introduction of the Wari influence and climatic changes of a Mega Niño phenomenon. This pattern, however, will not be as severe as in other regions (e.g. south coast and south highlands), because of the non-intensive nature of the Wari presence in the area.

5. I expect an increase of the prevalence of malintent trauma (mostly non-lethal, both in males and females) during the second half of the Middle Horizon, as a consequence of the fall of the Wari Empire.

6. I expect that the prevalence of non-lethal and lethal malintent trauma in the overall adult (and possibly subadult) population in the Late Intermediate Period will be

similar to the prevalence of the Middle Horizon 3-4, as a consequence of the pan-Andean state of war of this period of political fragmentation.

7. I expect a decrease in the overall prevalence of malintent trauma during the Late Horizon, related to the Inca control in the area (e.g. movement of new population into the area and imposition of new ideologies). The prevalence and severity of malintent factures will be more pronounced among groups that were settled in the highlands-coast border, especially among military groups.

8. I expect that individuals from the Early Colonial period will show a dramatic increase in the prevalence of malintent trauma, representing violent encounters with the Spaniards.

Chapter 4

4 Materials and Methods

This chapter starts with the description of the 14 skeletal samples and the presentation of the 13 pre-Hispanic and Early Colonial sites from which the samples studied in this dissertation were derived, presented in chronological order (Figure 4.1). Then, it presents the methods employed to obtain the osteological data. It also discusses the challenges faced and the solutions given to create the databases that compiled the information collected by different people over a long time span.

Figure 4.1: Map of the Peruvian Central Coast and the Sites of Study. Map by Fiorella Rojas

4.1 Materials

The 736 individuals from archaeological contexts analyzed in this dissertation come from the 13 archaeological sites that have been already described. They range from the Initial to the Early Colonial periods, and include the three main valleys that compose the Peruvian central coast: Chillón, Rímac, and Lurín. In addition, four small Early Horizon cemeteries (Asia, Asia Baja, León Dormido 3, and León Dormido 17) from a nearby area south of Lima were included.

The preservation of the material ranges from skeletons in poor to fair condition (La Capitana, Asia, Asia Baja, Tablada de Lurín, Huaca 20, and Pueblo Viejo-Pucará) (Figures 4.2 and 4.3) to individuals with good to very good conservation (León Dormido 3, León Dormido 17, Cerro Culebra, Copacabana, Ancón, Armatambo-22 de Octubre, and Puruchuco-57AS03) (Figures 3.3 and 3.4). The classification for preservation was made based on the observation of the integrity of the bones and the conservation of soft tissue:

a) Very Good: Strong. No fragmentation. Occasional preservation of hair and soft tissue.
b) Good: Relatively strong. Little or none fragmentation
c) Fair: Fragile. Fragmentation of weakest areas (e.g. epiphyses, ribs, and facial bones).
d) Poor: Very fragile. Fragmentation of many parts of the skeleton.

Commingled, completely mummified, incomplete, or very badly preserved remains were removed from the sample. Commingled remains are an important source of bias in a research project of this sort, because they make it difficult to carry out refined analysis, such as the correlation of patterns of lesions throughout the entire body, or the correlation of post-cranial injuries with sex. In the same way, the use of isolated skulls not only prevents the analysis of the entire body, but also affects the accuracy of sex assessment (depending on the degree of sexual dimorphism of the skull in a given populations). Thus, only individuals with more than the 80% of the skeleton present were used, with the exception of the sites of La Capitana and Asia, where the number of complete skeletons was so low that some individuals with more of the 50% of the skeleton had to be added to bolster the sample size. In such cases, the presence of the upper half of the body (including the skull) was a requisite. The final sample size for this study was 736, one of the largest compilation of skeletons for an osteological study in Peru.

In general terms, the selected samples can be considered a fairly good representation of the general population that was buried in their respective cemetery. The majority of these samples were recovered in salvage interventions that excavated most of the archaeological site (i.e. La Capitana, Asia, Asia Baja, León Dormido 3 and 17, Huaca 20, and Puruchuco-57AS03). Two other sites (Tablada de Lurín and Pueblo Viejo-Pucará) were excavated as part of field schools of the Pontifical Catholic University of Peru and have been intensively excavated for many years. More problematic are the cases of Cerro Culebra, Copacabana, Ancón, and Armatambo-22 de Octubre, because it is difficult to estimate how much of the site has not been excavated. Most of the samples represent between 50-80% of the total of the individuals that were recovered from the site. However, the Tablada de Lurín and Ancón samples represent a smaller proportion of their cemeteries (~5-10% of the exhumed individuals) and therefore, they could underrepresent their respective populations (Table 4.1).   This research includes individuals of different social status that were recovered from cemeteries of different characteristics. In sum, the sample escapes the common bias faced by excavations focused only on high status, ceremonial centres.

The study sample is mainly composed of primary data gathered by the author. Additional published and unpublished reports were added to expand the sample (see Table 4.1). All the analyses were undertaken over 14 years by seven different persons (Gaither, Kolp-Godoy, Lund, Murphy, Palma, Tomasto, and Vega)[67]. To avoid possible intra- and inter-observer errors, the collected data were re-evaluated following standardized criteria (see next section for details) before entering them into the database.

[67] Kolp-Godoy, Palma, and Vega were all trained by Tomasto in sex and age estimation methods. Lund, Tomasto, and Vega have collaborated on several bioarchaeological studies and share common methods.

Figure 4.2: Example of a Skeleton with a Poor Preservation (Tablada de Lurín, CF 362). Photo by Vanessa Salomón

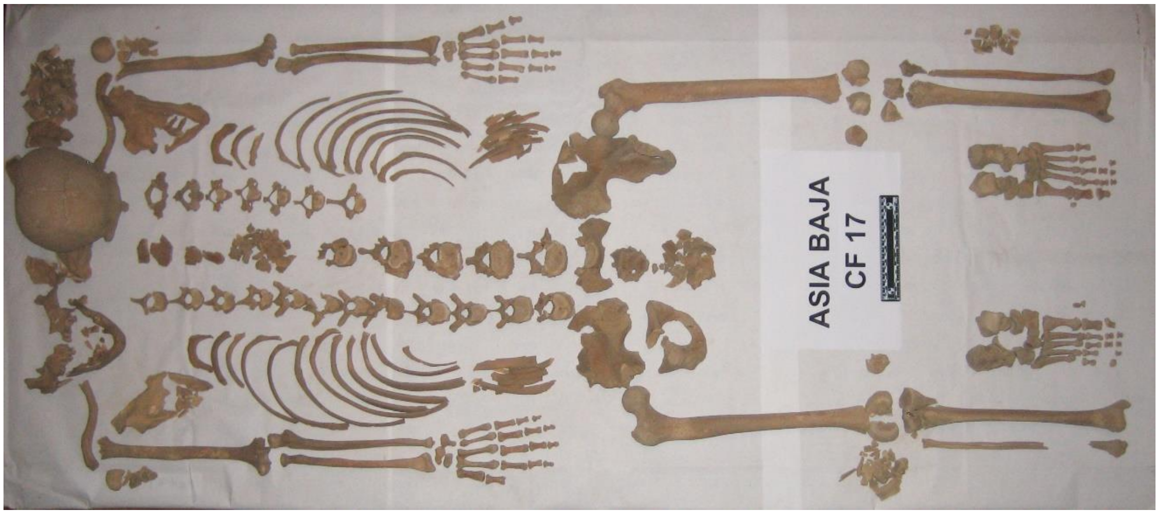

Figure 4.3: Example of a Skeleton with a Fair Preservation. Photo by Elsa Tomasto

Figure 4.4: Example of a Skeleton with a Good Preservation

Figure 4.5: Example of a Skeleton with a Very Good Preservation.

Photo by Gonzalo Irureta

Table 4.1: Samples Used in this Dissertation

Site	Chronological Period	Analyzed by*	Number of Individuals Analyzed	Approx. Percentage of the Recovered Individuals from the Site
Puruchuco-57AS03	Early Colonial	Murphy and Gaither (2006-2007); Lund (2008)	37	66.1%
Puruchuco-57AS03	LH	Murphy and Gaither (2006-2007); Lund (2008)	80	17.9%
Pueblo Viejo-Pucará	LH	**Vega (2001-2007)**	107	18.4%
Armatambo-22 de Octubre	LIP	**Vega (2013)**	50	20.2%
Ancón	MH 3-4	**Vega (2011)**	30	1%
Copacabana	MH 1 (Late Lima)	**Vega (2013)**	27	77.1%
Huaca 20	MH 1 (Late Lima)	**Vega (2003-2009)**	229	25.7%
Cerro Culebra	EIP (Middle Lima)	**Vega (2013)**	45	49.5%
Tablada de Lurín	EIP (White-on-Red)	**Vega (2012-2014)**	53	4.7%
León Dormido 17	EH (Formative)	**Vega, Lund, and Tomasto (2009-2010)**	07	87.5%
León Dormido 3	EH (Late Formative)	**Vega and Lund (2009-2010)**	06	54.5%
Asia Baja	EH (Late Formative)	**Vega, Lund, and Tomasto (2009-2010)**	16	66.7%
Asia	IP (Early Formative)	**Vega (2005-2006)**	15	57.7%
La Capitana	IP (Early Formative)	Kolp-Godoy and Palma (2008)	34	47.9%
TOTAL			736	

* Years in parenthesis refer to the date of the analysis, not of the publication. Bold entries refer to primary data gathered by the author.

4.2 Description of the Sites used in this Study

4.2.1 La Capitana

La Capitana is situated on the north margin of the Rímac River, 1 km from the river, in the area known as Huachipa (middle valley). The site is located inside a field bought by MAPFRE, an insurance company, to construct a modern cemetery. In 2005, archaeologist Enriquez directed an archaeological salvage project in the area, discovering farming terraces associated with irrigation canals from the late pre-Hispanic periods, a funerary area containing 58 tombs of the Late Intermediate Period (most of them looted or altered by subsequent burials), and 62 funerary contexts from the Initial Period, buried underneath the canals (Enriquez 2005).

Further studies of the site are limited to a preliminary bioarchaeological report and a paper in a paleopathology meeting (i.e. Kolp-Godoy and Palma 2009 and Kolp-Godoy et al. 2011). Kolp-Godoy's and Palma's paleodemographic reconstruction, based on 71 individuals of the Initial Period showed a high percentage of middle adults and early childhood subadults. They reported that the general presence of pathologies in this sample was low, with the exception of vertebral pathologies in adults. There were some cases of fractures (attributable mostly to falls, not discounting the possibility that some were activity-related), periostosis, and porotic hyperostosis/cribra orbitalia. Their meticulous dental study showed that females were more prone to present dental fractures and pathologies (e.g. some types of caries and tooth wear) than males and subadults. The authors concluded that female adults performed a specific activity, possibly related to the preparation of a diet based on grains and fibers or other subsistence labour.

Information on 34 individuals from La Capitana is used in this study, directly taken from the recording forms filled out by Palma and Kolp-Godoy, generously provided by the authors, with the authorization of project directors Elizabeth Enriquez and Jonathan Palacios.

4.2.2 Asia and Asia Baja

Asia and Asia Baja are two sites of the Formative period, located between km 99 and 100 of the South Pan-American Highway, 1-2 km from the seashore of the district of Asia, (Cañete province, department of Lima), on the north margin of the Asia (or Omas) River (Bautista 2011; Salcedo 2004; Villacorta 2005, 2006). The sites are situated in the lower part of the valley of the Asia River, which only flows during summer, impeding the production of large-scale agriculture or the growth of dense vegetation. Culturally, both sites are part of the south-central coast and the semi-seasonal populations that lived in the region during the Initial Period.

Both sites were excavated in two different archaeological salvage interventions. Asia was excavated in 2005 by Villacorta (2005, 2006), contracted by Revolutions Perú S.A.C. to evaluate three areas destined for the construction of a recreational centre. Except for one low cultural mound, the terrains were flat and leveled for modern use. This mound had an elevation of 2 m (although affected by modern constructions), formed by the succession of cultural deposition (*Mesodesma donacium* (clam) shells, organic remains, some ceramic sherds, etc.), similar to the many mounds of this kind that were reported by Engel (1963)[68] in the nearby area. A total of 23 burials containing the remains of 26 individuals were discovered at the site (Vega 2015b, Villacorta 2006). The ceramic fragments found in the area date the site to the Early and Middle Formative periods (Oshige and Carbajal 2015). Although the absence of ceramics directly associated with the skeletons makes their chronological designation quite difficult, the burials have been assigned to the Final Archaic or Early Formative period (del Carpio 2015). Most of the individuals were young females and children younger than 5 years old. Common pathologies among these individuals were non-specific stress indicators, accidental trauma, treponematosis, and severe tooth wear (possibly associated with seafood consumption) (Vega 2011a, 2011b, 2015b).

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[68] Engel (1987:165) found twenty Preceramic and eighty-seven Formative “villages” or shell mounds in the lower Omas Valley. The great amount of *Argopecten purpuratus* (scallop) found in these mounds may have been related to the appearance of temporary coastal lagoons formed by inundations that could be related to an El Niño phenomenon (Engel 1963; Parsons 1970).

Asia Baja is an archaeological area of ~575 m², approximately 1 km to the south of the previously described site. The site lies in the area in which the Camisea liquid gas pipeline was constructed. It was first evaluated by archaeologist Salcedo (2004), and years later, an archaeological salvage led by Bautista (2011) was conducted. The site was subdivided in two sectors: Asia Baja Este y Asia Baja Oeste (East and West Asia Baja) and included middens formed by depositions of ash, seashells, and sherds; and a total of 21 burials (19 in the west area, and two in the east area) (Bautista 2011:68-85). Although the majority of the evidence is from the Late Formative period (Maquera 2010), there is also one burial from the transition to the Early Intermediate Period and two burials from the transition to the Middle Horizon (Bautista 2011:76). A total of 24 individuals were recovered from the site, mostly individuals under 5 years (37.5%). As was seen at the site of Asia, many individuals presented non-specific stress indicators, accidental trauma, and severe tooth wear; although there was no evidence for treponematosis. Vertebral osteoarthritis and intervertebral disc disease was common. Fronto-occipital cranial modification was also present (Vega 2010).

As part of the sample of the present study, I selected 15 individuals from Asia (studied by myself between 2005 and 2006) and 16 individuals of Asia Baja (studied together with Mellisa Lund and Elsa Tomasto between 2009 and 2010) (see section 4.2 for a detailed description of the sampling criteria).

4.2.3 León Dormido 3 and León Dormido 17

The León Dormido 3 and 17 sites are located close to kilometer 82.5 of the South Pan-American Highway, San Antonio district (Cañete province, department of Lima), about 2 km north of the Mala River, in the *lomas* ecosystem (Balbuena 2013; Bautista 2011). Similarly to Asia Baja, these sites were excavated by a team lead by Bautista (2011) as part of the archaeological salvage for the Camisea liquid gas pipeline.

León Dormido 3 is an area of 994 km² that lies in an undulating esplanade, with dunes and hills of moderate elevation dominating the landscape. Dispersed seashells and camelid coprolites were found in the area, as well as 11 funerary contexts (one of them, a secondary burial) and Late Formative ceramics (Balbuena 2013; Bautista 2011; Maquera

2010). It is thought that the site served as a seasonal camping site for seashell farming, as well as a transit area for camelid herding, and occasionally as a burial area (Bautista 2011). The individuals were buried in shallow pits, wrapped in textiles in a sitting position. Although grave offerings were not usually found outside the bundles, a Paracas ceramic vessel was found outside one of these burials (Balbuena 2013). Analysis of mtDNA by Fehren-Schmitz and Tomasto (2012), including some of the León Dormido 3 individuals, suggested that the Paracas populations from Palpa, Paracas and the Cañete Valley were closely related to each other.

León Dormido 17 has an area of 2926 m^2, and is a sandy plane surrounded by hills of moderate height. Dispersed seashells can be found to the east of the site, while a dense concentration of the same material is found to the west. It presents two different areas: The burial area to the north and an area of burned seashells (especially *Concholepas concholepas*) possibly related to funerary rites, to the south. Eight funerary contexts were recovered from the north area and one from the south area, and despite being recovered from two different stratigraphic levels; they are thought to belong to the same cultural group (Bautista 2011). Ceramic sherds found in the area relate the site to the Formative period (Maquera 2010).

Eight individuals were analyzed from each site (eight adults from León Dormido 3, and five adults and three subadults from León Dormido 17). As was seen in the two sites of the Omas Valley, non-specific stress indicators, severe tooth wear (specifically in León Dormido 3), and accidental trauma were commonly found in these individuals. Vertebral and knee osteoarthritis, intervertebral disc disease, and developmental disorders of the hips were also found in different skeletons. Parallel-fronto-occipital cranial modification was exhibited by some individuals (Vega 2010).

Six individuals of León Dormido 3 and seven from León Dormido 17 (studied by Lund, Tomasto, and myself between 2009 and 2010) are part of the sample studied here. The remaining skeletons were too incomplete or belong to another time period, so they were excluded from this sample.

4.2.4 Tablada de Lurín

Tablada de Lurín is a large site located in the fog oasis area of the lower Lurín Valley. It is situated 7 km away from the seashore, between the Atocongo ravine and the Castilla, Olivar, and Tres Marías hills, in the north margin of the Lurín River (Makowski 1994, 1996, 2009b). The site has been thoroughly excavated. The first interventions on the site began in 1958 when the Archaeology Seminar of the Riva-Agüero Institute of the Pontifical Catholic University of Peru (SAIRA-PUCP) started a series of excavations directed by Ramos de Cox. After Ramos de Cox' death in 1974, Cárdenas assumed the direction of the project, which finished in 1989 (Cárdenas 1999).

By the end of 1991, PUCP started a new archaeological project (PATL-PUCP), this time under the direction of Makowski. This project was also used as a field school until 1997, which marked the end of the intensive excavation of the site (Makowski 1994, 1996). In 2002, a last excavation was done in one of the collective funerary structures (Gerdau-Radonic 2007; Gerdau-Radonic and Makowski 2011).

Tablada de Lurín presents an occupation that began in the Preceramic period, with at least four sites including seasonal camps with evidence of circular dwellings, wind breaker constructions, hearths, seashell mounds, lithic artefacts and debitage of the Lauricocha complex, and a partially cremated skeleton (e.g. Cárdenas 1999; Makowski 1994, 1996, 2009a, 2009b; Ramos de Cox 1969, 1972; Salcedo 2012). Some ceramic fragments of the Initial Period (Cárdenas 1999:165), as well as a small domestic occupation of the Early and Middle Formative periods were also found (Jiménez 2002, 2009; Makowski 2009b). However, Tablada de Lurín is better known for the hundreds of burials from the transition from the end of the Early Horizon to the beginnings of the Early Intermediate period. Excavations at the site have determined the existence of two successive periods of funerary activity. The oldest corresponds to the burial pits cemetery and the other to the underground stone funerary chambers or *cistas* (cist burials) (Makowski, 2002a, 2009a).

The SAIRA-PUCP project excavated 414 burial pits and 30 *cistas* containing multiple individuals (approx. 552 in the burial bits and 199 in the *cistas*) (Cárdenas 1999), while the PATL-PUCP project found 678 burial pits and opened five *cistas* (excavating approximately 3.1% of the estimated minimum area of the site) (Burger and Makowski 2009; Makowski 2009a). Between 1991 and 2002, 569 individuals of the burial pits where excavated, with the sample consisting of around 54% infants and children between 0-9 years (especially 1 year and under), ~5% children and adolescents between 10 and 19 years and ~40% adults (Balbuena 1996; Makowski 2002b, 2009a; Tomasto 1998)[69].

Makowski (2002b, 2009a) calculated the approximate number of burial pits as 40,712 (which could probably contain 60,800 individuals) and considered, based on the low stylistic variability of the offerings, that this type of burial was used for around 300 years by habitants of different villages. The cemetery showed a probable predetermined organization, with extensive sectors, each composed of thousands of contemporary burials, separated by unused wide spaces, possibly representing territorial communities and extended families. The tombs were divided into four status groups, in which the lower status individuals presented no grave offerings, and the highest status persons presented between two and twenty-two grave goods, including weaponry (i.e. mace heads and spear throwers), gilded copper objects, and foreign (Topará) plates. These four categories did not create separate groups inside the cemetery and some objects were exclusively associated with a specific sex (e.g. *cantimplora* bottles and pottery implements for females and musical instruments, possible artifacts for hallucinogen consumption, weapons, and textile and furriery implements for males) (Makowski 2002b, 2009a, 2009b)[70]. Children between one and twelve years old received a similar funerary treatment to that of adults, but were not provided with some objects that were typically

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69 Based on a sample of 552 individuals recovered from the burial pits, Cárdenas estimated the presence of 27.5% of infants (<1 yr), 7% early children (1-7 yr), 2% old children (>7 yr), and 63.5% of adults (Cárdenas, 1999:46). These results differ with the paleodemographic reconstruction made by Elsa Tomasto for the PATL-PUCP. According to Tomasto (1998:8), the difference between SAIRA-PUCP's and her findings lies in the fact that SAIRA-PUCP had different excavation strategies, particularly with regard to the size of the tombs they chose to excavate.

70 The relation between *cantimploras* (or *frejoloide* jars) and females, and weapons and male individuals was also noticed by Cárdenas (1999:151, 156).

found with male adults (Tomasto 1998:154). Calibrated radiocarbon dates place these burials between 200 B.C. and A.D. 200 (Makowski 2009b:264).

In the beginning of the EIP a new burial tradition emerged. Balbuena's (1996) and Gerdau's (2007) excavations of the *cistas* showed that these chambers contained a variable number of individuals, who were not buried at the same time. Their taphonomic studies revealed a combination of events such as rearrangement of the bodies, secondary burials, intentional bone removal, and so on. No evidence of trauma or indications that the individuals died at the same time were found (Balbuena, 1996:25). The architecture and ceramics of these chambers are very similar to those found in the middle and upper Lurín Valley and it is possible that the dead were transported long distances before being buried, judging by the predominance of adults, the absence of infants, the low number of offerings (except for small objects) and the cases of secondary burials that were detected (Balbuena 1996; Makowski 2002b, 2009a, 2009b). The variation in the number of the individuals buried inside the intact structures (between two and twenty primary burials) and their reopening and rearrangements suggests that each *cista* was built by a family group and used until the death of the family founder (Makowski 2009a:231).

Diverse osteological analyses have been done in the Tablada sample, which indicate the presence of non-specific stress indicators, interpersonal violence, possible human sacrifices, and treponematosis (e.g. Cárdenas 1999; Makowski 2002b; Pechenkina et al. 2007; Vivar 1999; Vradenburg 2001). Craniometric and cranial modification studies have also been done (e.g. Piasecki 1999; Vivar 1998, 1999). More on these studies can be found in Chapter 3.

The present study includes a sample of 53 individuals (recovered from the burial pits of the SE area of the cemetery by the PATL-PUCP team) that I analyzed between 2012 and 2014. The sample was randomly selected among the best preserved individuals excavated by the PATL-PUCP project, representing 10% of each cohort recognized by Tomasto in internal reports for the project.

4.2.5 Cerro Culebra

Cerro Culebra is a Lima site of about 10 ha of size, located in the mouth of the northern bank of Chillón Valley, next to Cucaracha (or Chivateros) hill, Ventanilla district, in the Constitutional Province of Callao. It is composed of a ceremonial platform ("El Templo") surrounded by patios, terraces and subsidiary compounds, a possible domestic area, and adjacent cemeteries, the largest located in Quebrada II (Falcón 1993; Falcón y Amador 1997; Silva 1996; Silva et al. 1988; Stumer 1954). The ceremonial platform presented a mural painting approximately 65 meters long, representing interlaced fishes or birds in the "Interlocking" style (Agurto 1984:87). One of the central motifs showed an anthropological being probably holding two trophy heads (Paredes 1999; Stumer 1954) (see Figure 3.4 in Chapter 3). The site presents ceramics of the middle Lima style (Lima 4 to 6 of the Patterson sequence) (Falcón 1993; Paredes 1992; Patterson 1966).

Between 1952 and 1953, Stumer and his team recovered 48 adult and subadult individuals (including many mummies of children), which were later analyzed (Stumer 1954, 1955). However, the results of these investigations were never been published. In 1983, Silva and colleagues excavated at the site, identifying three architectonic phases in the central part of the building (Silva et al. 1988).

Between November 1992 and April 1993, Falcón, contracted by the National Museum of Archaeology, Anthropology, and History of Peru (MNAAHP) directed an archaeological salvage on the site, recovering 43 Lima funerary contexts. Some of these tombs contained two or more skeletons, although the great majority were individual contexts. Many of the individuals were found lying face down in a litter, showing a SW orientation and with few or no external offerings (Falcon 1993; Falcón and Amador 1997). Although it is known that some anthropological analyses were done on the material, the published information is limited to the mention of a fronto-occipital cranial modification in the *Entierro* 12 infant (Falcón and Amador 1997:58) and of the bilobate cranial modification in other individuals (Amador 1998:32-34). The present research includes 45 of these individuals (all the complete skeletons available in the MNAAHP), which I analyzed in 2013.

4.2.6 Huaca 20 of the Maranga Complex

Huaca 20 is located inside the campus of the Pontifical Catholic University of Peru (PUCP), on the east margin of the Maranga archaeological complex of the Rímac Valley, approximately 2700 m from the seashore. The site covered an area of about 18,000 m², with a 20 x 30 m mound constructed in the LIP as its most prominent feature. During the late EIP (and probably earlier, during the Middle Lima phase), it served as a domestic settlement of fishermen that was abandoned around A.D. 600, after water inundations destroyed a great part of the site (possibly related to an El Niño phenomenon). At the beginnings of the Middle Horizon, the site was reused as a cemetery, and new structures were built while some water canals were closed (Mac Kay and Santa Cruz 2000; Mauricio et al. 2009, 2015b; Prieto et al. 2008; Rengifo et al. 2006, 2007). The site was probably related to the monumental mound of Potosí Alto (or Huaca 19), just 100 m away (Mac Kay and Santa Cruz 2000:590). After its abandonment during the Middle Horizon, a mound for ceremonial and funerary practices was constructed. Radiocarbon samples date the beginning of this construction between A.D.1016 and 1215, while the associated ceramic assign the mound to the Middle Ychsma (LIP) phase (Mac Kay and Santa Cruz 2015).

The site has a vast history of investigations, starting in 1970 with a small excavation directed by Ramos de Cox (Cárdenas 1970) and in 1996, directed by Olivera (Rodríguez and Córdova 1996). Between 1999 and 2001, Mac Kay and Santa Cruz (under the direction of Cárdenas) opened larger areas of excavation (Mac Kay and Santa Cruz 2000, 2011, 2015). However, more intensive excavations in the site were performed since 2005, when PUCP decided to exhaustively excavate the area. Thus, three successive field seasons were conducted, this time under the scientific advice of Castillo (Mauricio et al. 2009; Prieto et al. 2008; Rengifo et al. 2006, 2007). Finally, two extra archaeological salvage interventions were done under the responsibility of Ramos (2010-2012) and Villacorta (2012-2013) (Muro and González Carré 2015).

Mac Kay and Santa Cruz (2011; see also Mac Kay 2007) argued that the site presented two Late Lima funerary phases, both of them with similar characteristics such as tombs intruding into the older domestic occupation, near or inside closed irrigation canals, which also separate groups of individuals. On the other hand, Mauricio (2012, 2015b) proposed the presence of four funerary phases. The first (poorly defined, possibly belonging to the Middle Lima period) is composed of 14 burials associated with the domestic architecture of the first phase of occupation of the site. This phase was followed by two Late Lima group of burials: Late Lima A and B. The former presented 19 tombs also associated to domestic architecture, while the latter is composed of 158 funerary contexts that intruded into the architecture, belonging to the time in which the site was exclusively used as a cemetery. These two Late Lima phases are separated by an event of strong inundations that affected a great part of the domestic architecture of the site. According to Mauricio, her Late Lima B phase corresponds to the first funerary sequence of Mac Kay's and Santa Cruz's (2011) subdivision, expressing doubts about the supposed organization of the burials following the possible irrigation canals as Mac Kay and Santa Cruz proposed. The last phase, "Terminal Lima", presented 37 burials, and was associated with both Late Lima and Nievería ceramics, and non-domestic architecture with Chakipampa sherds (Middle Horizon 1B). Some of these burials are associated with the closure of canals. Although the author stated that this sequence has a stratigraphic correlation, the creation of a "Terminal Lima phase" based on the presence of both Late Lima and Nievería ceramics is still controversial, since the more accepted position states that the Nievería vessels are markers of high status and appeared simultaneously with Late Lima ceramics (e.g. Goldhausen 2014; Guerrero and Palacios 1994; Kaulicke 2000; Mac Kay and Santa Cruz 2000; Marcone 2000; Mogrovejo and Segura 2000; Segura 2004; Shady and Narváez 2000; and Valdez 2015).

The individuals buried in Huaca 20 were likely commoners (fishermen, weavers, farmers, and raw material workers). Sumptuous metal artifacts and Nievería ceramics (thought to be prestigious) were scarce, and it is proposed that older individuals enjoyed higher status (Mac Kay 2007; Mac Kay and Santa Cruz 2011). Iconographic analysis performed by Fernandini (2015) in Huaca 20, suggested that Nievería ceramics lack foreign (Wari) designs, contrasting with other contemporaneous sites of the Rímac Valley (i.e. Cajamarquilla, Pucllana, and Maranga), indicating that the population of Huaca 20 had restricted access to these prestigious vessels due to their limited position inside the Lima society due to social, political and/or economic factors[71].

Around 890[72] Late Lima individuals were recovered at the site, but only 287 of them have been analyzed and published (Vega 2015a). A summary of my findings can be read in Chapter 3. The present dissertation includes 229 of these individuals, which were complete enough to be included as part of the sample.

4.2.7 Copacabana

Copacabana is located on the northern branch of the lower Chillón Valley (~12 km north of Cerro Culebra and ~14 south from Ancón), in the current districts of Puente Piedra and Carabayllo, in the northern part of the city of Lima. The site covers approximately 86 ha and is one of the most complex and extensive Middle Lima and Late Lima-Nievería settlements of this part of the valley. It presents two sectors: Sector A: composed by at least six pyramidal mounds and Sector B: domestic constructions, east of the mounds. It is possible that more precarious constructions were erected between these two sectors (Patterson 1966; Silva 1996).

Although the site has been described by different researchers (e.g. Uhle 1998 [1910]); Villar Córdova 1982 [1935]; Stumer 1954, Horkeheimer 1965, and Bonavia 1966), few excavations have been done in the site. The first test pits in the site were done by Patterson, who found Middle Lima ceramics, Late Lima and Nievería looted tombs, and some burials in litters without associations (Patterson 1966:108).

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[71] Although Olivera (2015b) reported the presence of Nievería vessels with Wari traits in the northern cemetery, he also stated that these vessels were more likely related to the nearby *huaca* Potosí Alto than to Huaca 20.

[72] The skeletons excavated around 2002 were analyzed by Palma and Escudero, while the sample excavated between 2010 and 2013 was preliminary studied by Lund, Tomasto, and myself, only providing estimations of age and sex. Pinilla (1985) also found 47 burials of the same period and with similar characteristics of the Huaca 20 tombs. It is possible that they were the same cemetery (Martín Mac Kay, personal communication 2004). None of these samples have been published.

Between 2012 and 2013, Víctor Falcón recovered 35 Late Lima individuals. Around 90% of these individuals were found in pits dug into the sand, with no associated architecture. They presented few or single associations, basically stone spindle whorls (*piruros*). Children presented more objects and snail necklaces, and may represent elite individuals (Renzo Ventura, personal communication 2014). All these individuals where analyzed by me, but only twenty-seven met the criteria to be included in the sample of the present research.

4.2.8 Ancón

Ancón is a large site of about 100 hectares located in the Chillón Valley, 42 Km to the north of Lima. It covers an area of 100 hectares running from the Coastal Range to the limits of the littoral. The area is mostly dry, with some evidence of large shell mounds and old *lomas* in the nearby hills (Cornejo 1994; Kaulicke 1997). It presents an intensive occupation from the Preceramic to the Late Horizon periods and it has been intensively scientifically excavated since the beginnings of the 20th century. According to Kaulicke, six areas are discernible: a) Ancón I or Tank site, containing tombs from the Preceramic and Early Horizon periods b) three fortress-like ring walls to the west, possibly constructed during the MH 4 c) Ancón II or the "*necropolis*", located to the north and east of the site (especially in the Miramar sector), containing tombs from the Middle Horizon to the Late Horizon periods and large shell mounds d) Base Aérea (PV 45-11), a landfill from the EIP 1 e) Polvorín (PV 45-57), a landfill of the EIP 2 at the base of Cerro Pasamayo, and f) a series of camps or workshops from the Lithic Period in the surrounding areas (Cornejo 1994; Kaulicke 1997; Ravines 1977).

Of all these areas, the *necropolis* is the most studied. Although it has been thought that the place served exclusively as a cemetery, the presence of some low stone structures suggest that it could also have a domestic occupation (Kaulicke 1997; Ravines 1977, 1981).

The first information about Ancón was given by superficial recollections of non-contextualized material or unscientific digs. For example, during the late 19th and early 20th centuries, French travellers such as Ber, Wiener, de Cessac, and Berthon collected samples to be sent to institutions and museums in France (Riviale 2000). In 1913, Hrdlička also collected skulls and some post-cranial bones (Merbs 1980; Rogers 1980).

Nevertheless, numerous archaeological excavations have been done in the area that recovered hundreds of burials from the Preceramic to the Late Horizon (see Cornejo 1994; Kauffmann 1994; Kaulicke 1997; and Ravines 1977; whose reviews about the history of excavations in the site are summarized below) beginning with Reiss' and Stübel's digs (1874-1875), later followed by Wiener (1876), Hjalmar Stolpe (1884), Dorsey (127 tombs recovered between 1891 and 1892), Uhle (~60-70 tombs excavated in 1904, plus some more recovered in 1908), Berton (1907), and Willey and Newman (20 burials found in 1941).

During the 1940s, the Patronato Nacional de Arqueología (National Board of Archaeology) started a series of archaeological salvage excavations directed by Tello (1945-1947) and Carrión Cachot (1947-1950) from the MNAAHP. The directorate of the Inspección de Monumentos Arqueológicos (Archaeological Monuments Inspection) later resumed the excavations, this time under the direction of Gonzáles and Ccosi (1950-1953). After that, the Sección de Exploraciones y Conservación de Ruinas y Monumentos Arqueológicos (Exploration and Conservation of Monuments and Archaeological Ruins Section) of the Dirección de Arqueología e Historia (Directorate of Archaeology and History) organized more excavations under the direction of Vicente Segura (1955, 1959, and 1965). Later excavation campaigns were directed by Vidal and Guzmán Ladrón de Guevara (1966), Vidal (1968-1969), Ghersi and Samaniego (1969-1970), and a final excavation in 1976 by Ravines, under the direction of the Instituto Nacional de Cultura (INC, National Institute of Culture). In total, the archaeological missions founded by the Peruvian government documented more than 3130 funerary contexts. The materials were deposited in the National Museum of Archaeology, Anthropology, and History of Peru (MNAAHP) and in the Site Museum of Ancón without further analysis.

Several efforts have been made to study the material recovered by the national campaigns. Iriarte (1959) wrote his Bachelor's thesis using part of the material recovered by Espejo, Ccosi, and Casafranca. Ravines (1977, 1981) published two articles based on the work of Gonzáles and Ccosi, presenting 49 funerary contexts containing the remains of at least 30 individuals dating from the MH1 to the LH. Rafael Segura (1997) also presented the first insights about 95 burials of the MH 4 from Ancón. However, to date, the most detailed efforts to summarize the available data from the aforementioned scientific excavations (both foreign and local) are found in Kaulicke's book "Contextos Funerarios de Ancón" (1997).

In 1994, the Ancón Archaeological Investigations Centre (CIAA) and the Universidad de Lima started a new excavation leaded by Kauffmann (1994) in the Miramar area, located in the northern sector of the cemetery. Thirty individuals from twenty funerary contexts, associated with MH 2B, 3 and 4 ceramics, were recovered in an area of 10 x 6m[73]. De los Ríos made an analysis of these contexts, observing that males received special treatment, receiving the most prestigious goods. In contrast, children presented lesser objects and females usually did not exhibit prestigious goods (except three females with earspools)[74] (De los Ríos 2011:90-91).

Funerary contexts from the MH 4 were also found by Reiss and Stübel, Uhle, Gonzáles and Ccosi. The data gathered by Kaulicke (1997) informed us of the construction of a wall ring that surrounded the cemetery and the presence of a new tradition of roofed quadrangular funerary chambers, with burials of one or up to 16 individuals in a single tomb, bundles with or without false heads (less elaborated than in the previous time period), a possible gender-based difference in the body treatment, sumptuous objects (e.g. golden bracelets, ceramic earspools, *Spondylus*), and the appearance (possibly the first time) of weighing scales. Weapons (e.g. stone or wooden maces and spears) apparently appeared more frequently in this period. Women were associated with textile instruments. Similar objects were found in the burials excavated by Kauffmann (1994).

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73 Kaulicke (1997:v) opined that these burials belonged mainly to the MH 4, with some unclear cases of the end of the MH 3, a thought that is shared by Gabriela De Los Ríos. In her opinion, all these contexts belong to the end of the Middle Horizon, because there are no clear limits in the MH subdivisions, as the ceramic styles last more time than was previously thought (De los Ríos 2011:47-48).

74 Although De los Ríos did not undertake precise sex estimation for these individuals, my observation confirmed that the three skeletons were female.

The role that Ancón played during the second half of the Middle Horizon is uncertain. The appearance of Teatino style vessels during the MH 2B to 4 marked the end of a close relation between Ancón and the southern valley of the central coast (starting at the beginnings of the EIP), that was replaced by a stronger connection with the valleys of Chillón and Huaura (north-central coast) (Kaulicke 1997). Menzel (1977:46) stated that Ancón was under the control of Pachacamac, the principal religious centre of the central coast at that time. However, Kaulicke (2000:345-346) argued that the Ancón elite belonged to the Teatino group, and used sumptuous objects from various areas, including middle-quality Pachacamac ceramics imitations. It is possible that Ancón became an extensive settlement with some urban characteristics during the MH 2, possibly serving as a port that connected the central and north coasts (Kaulicke 2000:345). The MH 4 burials were not as rich as the MH 2-3 tombs, presenting metals tools and local ceramic. However, they still presented objects from distant areas (Kaulicke 1997).

In contrast to the large number of individuals recovered from the site, the osteological analysis has been relatively limited. Reichlen (1982) presented a typology of cranial modifications using material recovered by French travellers deposited in the Laboratory of Anthropology of the National Museum of Natural History in Paris (Musée de l'Homme), which included skulls from Ancón, Pachacamac, Miraflores, and Hacienda Márquez. There have been some dental analyses such as the theses of odontologists Dabbert (1950), Vásquez (1961), Alcalde (1986), Valdivia (1988), and Botetano (2004), as well as an investigation by Morales (1911). However, they lack reliable chronological information and some of them combined material from different pre-Hispanic periods as a single corpus of study.

Analysis of MH individuals from Ancón has been presented by Montoya (1994), Slovak (2007, see also Slovak et al. 2009, and Slovak and Paytan 2011), Rojas-Sepúlveda and Dutour (2009) and Pink (2013). Craniometric analysis on LIP individuals were done by Ross and colleagues (2008) and Bethard (2013). A summary of their findings can be found in Chapter 3. The case of an adult female with metastatic carcinoma (from the MH or LIP) was presented by Fitz-Simmons and Weinstein (1994). Currently, Watson is conducting doctoral research on a small collection of isolated bundles recovered during the 1950s or 1960s and the funerary contexts recovered by Kauffmann and his team in 1994. In her work, Watson combines funerary reconstructions with some osteological indicators such as non-specific stress indicators, cranial deformation, osteoarthritis, and trauma (e.g. Watson 2013a, 2013b).

The 30 individuals from the MH 3-4 found by Kauffmann (1994) were analyzed by me and are part of the sample of this dissertation.

4.2.9 Armatambo

Armatambo is a large site (~153 000 m² in 1984) located in the Rímac Valley, at the eastern skirt of the Morro Solar (Solar Hill) in the Chorrillos district of Lima. It is located on the left margin of the great terrace of the alluvial fan formed by the Rímac River. This monumental site was an urban centre from the Late Intermediate until the contact period. It was composed of different closed architectonic units (of a residential, administrative, and religious function), that were united by streets, pyramids with ramp (concentrated in the northern part of the site), and cemeteries (Díaz 2004; Díaz and Vallejo 2002a, 2002b; Hyslop and Mujica 1992). It is thought that Armatambo was the main settlement of the Sulco *curacazgo* and it could have been the natural port of Pachacamac (Díaz 2004).

As with Ancón, Armatambo has a long history of excavations. The first references of the site came from Cobo (1956[1639]]) who described the presence of houses of *caciques,* surrounded by the houses and burials of a large population in the Morro Solar. Travellers such as Salvin, Squier, Wiener, and Middendorf also mentioned the site in their journals. The first scientific excavations started in 1892 with the work of Bandelier (see Hyslop and Mujica 1992), and were followed by Uhle in 1908. Unfortunately, Uhle's data were not published (Aguayo 2008). Further excavations were done by Tello, Bragayrag, Tosso, Vallejo and Ruales, Pérez, Guerrero, and Díaz, among others (for further details see Aguayo 2008; Hyslop and Mujica 1992; Díaz 2004, 2011).

During the Inca occupation, some parts of the Ychsma structures were used as burial areas, while others were remodelled using the new techniques introduced by the Incas. This period also marked the introduction of Inca style objects and pigments, sumptuous metal and warm water mollusc (i.e. *Spondylus princeps*, *Conus sp.,* and *Ostrea sp.*) at great scale in the funerary rites (Díaz 2004). Guerrero (2004:162) stated that during the Late Horizon the cemeteries were sectored and the amount of offerings was substituted as a status marker by the textiles, something that he also noted in the Rinconada cemetery (Rímac Valley). According to Díaz and Vallejo (2002b:368-369), the use of more textiles in the bundle preparation, and the diminution of the number of vessels as offerings started in the Late Ychsma A phase (immediately before the arrival of the Incas to the central coast). In the Late Ychsma B phase, the changes in the funerary patterns were more noticeable and variant (e.g. Inca ceramics, predominance of burials of multiple individuals, and burials intruding (and modifying) previous architecture).

Díaz recovered 189 funerary contexts from the Late Intermediate ("22 de Octubre" sector) and 32 from the Late Horizon (Huaca San Pedro) (Díaz 2004:586), 50% of them corresponding to infants between 0 and 3 years (Luisa Díaz, personal communication 2012). The "22 de Octubre" cemetery was located near Huaca San Pedro and contained 189 funerary contexts of the Middle and Late Ychsma phases. The bundles were usually composed of two or three layers of plain textiles and the presence of metals was restricted to some small plates made of "poor alloy" found in the eye orbits, inside the mouth, or in the hands in adults and subadults. Males could present metal tweezers and females folded plates. The burial associations did not show a great status differentiation with the exception of the presence of one complex funerary context. According to Díaz (2004), only the rulers received *Spondylus* (*mullu*) as grave offerings.

Eleven LIP individuals of "22 de Octubre" were partially studied by Aguayo (2008), while the 56 individuals from the "Héroes del Pacífico" cemetery, excavated by Pérez in 1997 were analyzed by Chan (2011). Their most important findings are summarized in Chapter 3. There are some hints that violent confrontations could have happened in the site. Besides Aguayo's (2008) findings, Bandelier found "probably several dozens" of tombs of unknown date in the site, in which the proportion of violent deaths was high, including two skulls with possibly injuries caused by a mace[75]. He also reported the recovery of some weapons in his excavations (Hyslop and Mujica 1992).

Fifty individuals of "22 de Octubre" (including 10 of the skeletons previously studied by Aguayo) were randomly selected (representing 20% of each of the cohorts recognized by Díaz 2011) and analyzed in this dissertation[76].

4.2.10 Pueblo Viejo-Pucará

The Pueblo Viejo-Pucará site is located in the fog oasis area of the Lurín Valley, 15 km from the Pacific Ocean. Although the site is located in the coastal area, the complex is organized in a pattern that is similar to those seen in the central highlands (stone domestic units with a modular organization, storage depots reused as funerary chambers that contained up to 30 individuals). It is thought that this was the main settlement of the Caringa, (a highland group with origins in the adjacent to Huarochirí) and the second settlement in importance (after Pachacamac) in the area. The site presents about 570 domestic units, distributed in four agglomerations of domestic architecture with a 200-300 m apart. There are also two orthogonal complex structures, possibly elite residencies (the more monumental in the lower part, the other in the upper part, both related to two domestic units), and a temple in the upper part of the site. It was constructed during the Late Horizon and it was possibly abandoned shortly after or during the time of the Spanish conquest the valley (A.D. 1470-1533 approximately). There is also evidence of camelid herding activities and the military control of the valley. *Spondylus princeps*, copper and copper alloys, silver, gold, limited amounts of lead, fine Inca style ceramics, etc. are evidence of the privileged position of Pueblo Viejo-Pucará in the Inca political structure. The people who lived at the site were closely related to the Yauyos highlands

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[75] A picture provided by Hyslop and Mujica (1992:Figure 10) showed these crania. The one to the left showed at least four clear circular defects with radial fractures (three of them in the right side) to the back of the skull (parietals and occipital) that are consistent with fractures caused by a star-headed mace. The case on the right, shows a circular defect in the occipital bone of unclear origin.

[76] Samples of teeth and ribs were taken for isotopic analysis from different individuals by Sara Marsteller, PhD candidate of Arizona State University, whose results await publication.

group, and were possibly a population displaced as *mitmas* (see Barraza and Vega 2011; Córdova 2011; Habetler 2007; Hernández 2008; Lizárraga 2005, 2009; Makowski 2002a; Makowski and Vega Centeno 2004, Makowski et al. 2008; Watson 2009, 2012).

The site, which covers an extensive area of 10 ha (not including the cultivation terraces or the satellite sites), can be broadly divided in two halves: a lower part known as "Pueblo Viejo" (sectors I, II, and III) and a higher part known as "Pucará" (sectors IV and V). Sector I presents households units with internal patios (Lizárraga 2005) associated with camelid corrals (Watson 2009). Sector II was a palace complex or elite residence (Córdova 2011) that also presented camelid corrals (Hernández 2008). Sector III is a household-administrative complex (Watson 2012) with areas of garbage deposition (Vega Centeno 2004). Sector IV presents an elite residency, although not as important as the one located in Sector II (Habetler 2007), that is associated with other household units of possible soldiers (Barraza and Vega 2011). Sector V also presents agglomerated architecture that is still under study.

Approximately 580 individuals have been recovered from the five sectors of the complex. They were buried in underground chambers, burial niches, inside deposit rooms reused as funerary chambers or in rooms roofed with perishable materials (Habetler 2007; Hernández 2008; Watson 2012). The skeletons were analyzed by four different people (Kolp-Godoy, Palma, Vega, and Watson). Preliminary observations of the material show non-specific stress indicators in more than 30% of the population. Dental caries (~35-40%) and trauma (~15-20%) were also present. Although this first study did not find any differences between elite and non-elite individuals (Watson et al. 2009), a recent study (Kolp-Godoy et al. 2014) seems to contradict these findings[77]. Watson (2012) also found sex and status differences in her study of musculoskeletal stress markers in individuals from Sectors I, II, and III. Interestingly, Watson also reported mtDNA analysis that

[77] The authors also estimated considerable lower rates of non-specific stress markers (~1-2%) and trauma (<1%). However, it must be noted that they used mostly commingled and incomplete remains and that their rates includes both observable and non-observable cases, clearly underestimating the true prevalence of these pathologies.

showed that individuals buried together in these sectors were not related on the maternal line.

For the purposes of this research, I will focus in 44 individuals from Pueblo Viejo and 63 from Pucará that were analyzed by me between 2001 and 2007.

4.2.11 Puruchuco-Huaquerones

Puruchuco–Huaquerones is a complex site located in the current district of Ate, in the east of Lima, in the "neck" of the Rímac Valley. It is composed of architectonic structures, landfills, and few burials from the Formative and EIP-MH periods, and different cemeteries and few structures of the LH and Early Contact Period. There are also about 10 pyramids with ramps of the LIP that have not yet been excavated (Cock 2006; Cock and Goycochea 2004; Farfán 2000; Gamboa and Cock 2008). The most distinctive building is known as "the Puruchuco Palace", constructed during the LH that possibly served as an elite residency or palace of the maximum local authority that was directly linked to the Inca. The presence of public spaces and objects such as quipus and scales denotes the possible administrative function of the Palace, although the performance of rituals in the structure is not discounted (Villacorta 2004b). The site is located in the Lati *curacazgo* limits.

Between 1999 and 2001, Cock excavated the largest Inca cemetery known, recovering a total of 1286 funerary bundles (552 of them undisturbed) (Cock and Goycochea 2004). Haun's and Cock's (2010) biodistance study of 90 males and 72 females of the Late Horizon showed than two-thirds of the males were biologically homogeneous and of coastal origin. Conversely, around 50% of the females were biologically diverse and probably came from the highlands. The authors also noted that Puruchuco-Huaquerones group was biologically closer to central Andean groups than to other coastal populations, but the sample does demonstrate a lot of diversity.

The same archaeologist excavated the cemetery denominated 57AS03 between 2004 and 2007, in which tens of skeletons exhibiting multiple perimortem traumas (two of them, gunshot wounds) were found. The skeletons are thought to belong to the native soldiers who died in 1536 during the Inca Rebellion, in what is known as “the Siege of Lima”. This constitutes the first archaeological evidence of the violent encounters that the Spaniards and indigenous people had during the first years of the conquest of the Andean region (e.g. Gaither 2012; Gaither and Murphy 2012; Lund 2009; and Murphy et al. 2010, 2011).

Before Cock’s excavations, limited interventions were done at the site. Between 1953 and 1960, Arturo Jiménez Borja restored the Palace and created the Site Museum of Puruchuco (Villacorta 2004b). In 1956, Jiménez Borja excavated a funerary chamber containing three bundles, one of them containing the remains of one male of high status, one female, and to subadults (Tabío 1965). Farfán (2000) excavated the Huaquerones area in 1985, finding evidence from the EIP to the LIP. In 2000, Lumbreras made an archaeological salvage on the road that serves as an entrance to the site museum, finding pre-Hispanic structures and some tombs that could belong to colonial times (Cock 2006; Gamboa and Cock 2008).

Murphy reported the presence of 69 “atypical” burials, described as unusual contexts that broke the funerary patterns exhibited in the Late Horizon[78], presenting few, if any offerings, one or two textile layers and no bundle fill. The body position varied (semiflexed, supine, semiflexed-supine, extended prone) and usually they were not oriented toward the northeast. They were placed mostly in the most superficial levels and at the peripheral area of the cemetery. Each burial was a separate event that occurred within a short time span (Cock 2006; Murphy et al. 2010). All these characteristics suggest that the bodies were hastily buried (Murphy et al. 2010). As no genetic differentiation or demographic changes were detected between the Huaquerones and the 57AS03 cemeteries, Murphy and colleagues assumed that both belong to the same

78 The funerary pattern of the site show individuals wrapped with layers of textiles in a sitting position, forming big bundles (some of them with a cylindrical appendix or “false head” on the top). They are filled with cotton or cotton seeds. A net covering the external part of the bundle (only leaving a free space at the level of the face of the individual) is also common (Cock and Goycochea 2004:190-191). The predominant orientation of the individuals is toward NE (Cock 2006).

population (Puruchuco-Huaquerones), something that was corroborated by Bethard’s (2013) craniometric analysis.

As was already presented herein and in Chapter 3, the high prevalences of perimortem trauma and type of weapon used, convincing link these individuals to a violent encounter during the first years of the Conquest. The majority of the perimortem fractures to the skull were located in the anterior cranial vault, indicating that the individuals were facing the perpetrators. However, the number of cases of perimortem trauma to the postcranial skeleton (especially the thoracic region) is also high (Murphy et al. 2010). Two of these individuals (burials 123 and 151) presented gunshot wounds and a third individual (Burial 248) presented small quadrangular defects consistent with a steel-edged weapon such as the top spike of a polearm or the beak of a war hammer (Lund 2009; Murphy et al. 2010). However, the majority of the wounds were produced by blunt force either by European or indigenous weapons or by trampling by horses (Lund 2009; Murphy et al. 2010).

The problem with both studies (from now referred to as Murphy-Gaither and Lund) is the composition of the sample. Murphy-Gaither included extended subadults as “atypical”, when it is known that this position was commonly found among infants and young children during the LIP and the LH in the central coast (e.g. Cock and Goycochea 2004; Guerrero 2004). Murphy-Gaither’s and Lund’s work also included two tombs (Burial 449 and 460) from the first half of the EIP. It seems that the aforementioned scholars did not possess the preliminary information given by the project staff with the stratigraphic and contextual information from the field.

The present dissertation re-evaluates Lund’s and Murphy-Gaither’s findings, combining information taken from Murphy’s and Gaither’s publications (i.e. Gaither 2012; Gaither and Murphy 2012; Murphy et al. 2010, 2011, 2014) and Lund’s (2009) master’s thesis with data contained in Lund’s recording forms (generously provided by the author) and inventory of the skeleton and sex and age data generated by Murphy and Gaither (digitally recorded and in possession of Guillermo Cock) which the authors agreed to share with me. Eighty individuals of the LH and 37 Early Contact individuals were selected to be part of the sample of this research.

4.3 Methods

4.3.1 Biological Profile

4.3.1.1 Sex Determination

Sex in adults was estimated using pelvis[79] and skull[80] traits (following Buikstra and Ubelaker 1994). Pelvic features (especially those of the pubis) were preferred over cranial ones, because the former have a reliability of between 90 and 95% (Brothwell 1981), while the latter vary slightly among populations, having a precision of between 80 and 90% (Ubelaker 1999). Each adult was assigned to one of the following categories: female, probable female, probable male, or male. Individuals classified as undetermined or ambiguous sex were not considered in the final sample of 736.

In the case of subadults, although there are some morphological differences in the skeleton between sexes beginning in the intra-uterine phase, sex determination is not reliable until the post-puberty period (Scheuer and Black 2000). Thus, sex determination in subadults was left as “undetermined”, with the exception of some adolescents with a fully developed pelvis and the very few cases of individuals with mummified genitals. In the case of individuals directly associated with female or male clothing (e.g. dresses for females and loincloths for males), sex was assigned as “probable female” or “probable male”.

There was only one contradiction in the sex determination of an individual given by two different researchers: burial 366 of Puruchuco-57AS03. While Murphy determined that it was a female (based on pelvic and skull traits), one of Lund’s assistants suggested that the individual was a male (with gracile cranial features). Relying on Murphy’s more

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[79] Ventral arc, sub-pubic concavity, ischio-pubic ramus ridge, greater sciatic notch, and pre-auricular sulcus

[80] Nuchal crest, mastoid process, supra-orbital margin, glabella, and mental eminence

detailed descriptions and the individual's garment and associations (a possible dress, spindles, and threads around the upper limbs) (Cock 2006:458), I finally concluded here that the individual was a female.

4.3.1.2 Age Estimation

Age in subadults was estimated based on dental development (Gaither 2004; Smith 1991; Ubelaker 1999), long bone and ilium measurements (Gaither 2004; Vega 2009b), and ossification and fusion of skeletal elements (Fazekas and Kósa 1978; McKern and Stewart 1957; Scheuer and Black 2000). In the case of the adults, age was estimated by observing the changes of the pubic symphysis (Suchey et al. 1988), sternal rib ends (Işcan and Loth 1986a, 1986b), and auricular surface (Lovejoy et al. 1985).

The estimation of age was performed during two consecutive months using the data collected in the recording forms or data bases. Pubic symphysis in adults and dental development in subadults were preferentially weighted due to their higher accuracy (Brothwell 1981; Buikstra and Ubelaker 1994; Martrille et al. 2007; Nawrocki 2010; Scheuer and Black 2000; Ubelaker 1999; White et al. 2012). In cases where the observers used methods not employed in this dissertation, the result was modified. For example, Kolp-Godoy and Palma's (2009) estimation based on Hillson's (1996) dental development was replaced by the result given according to Ubelaker's (1999) dental chart. In this way, every age estimation followed the same criteria, regardless of the date in which the original study took place or the person who collected the data.

4.3.1.3 Cohort Assignment

After the sex and age assessments, each individual was assigned to one of the following cohorts:

a) Infants (0-1 year)
b) Early Children (2-5 years)
c) Late Children (6-12 years)
d) Adolescents (13-17 years)
e) Young Females (18-34 years)
f) Middle Adult Females (35-50 years)

g) Old Females (50+ years)
h) Young Males (18-34 years)
i) Middle Adult Males (35-50 years)
j) Old Males (50+ years)

The categories for subadults are those used by pediatricians (Scheuer and Black 2000:468), while the adult categories were slightly modified from those recommended in Standards (Buikstra and Ubelaker 1994:9) to include late adolescents, who are sometimes (osteology-wise) difficult to distinguish from individuals in their early twenties.

In order to detect bias in the samples, the cohort distributions were compared to the expected mortality profile usually found in pre-industrial societies: an attritional mortality or “bathtub curve”, which shows a rise in the death rates of the youngest and oldest age groups (Chamberlain 2006; Séguy et al. 2008; Wood et al. 2002).

4.3.2 Chronological Period Assignment

The chronological period of each sample was assigned using information contained in field reports, theses, and publications about the sites. In some cases (i.e. Asia, Asia Baja, León Dormido 3, León Dormido17, and Copacabana) the chronological affiliation was communicated verbally by members of the archaeological project in which those individuals were excavated.

Because the main goal of this dissertation is to see how socio-political changes can affect the prevalence of violence in a population, some of the chronological periods were subdivided in order to isolate transitional moments between major periods (e.g. White-on-Red – the transition between the Early Horizon and the Early Intermediate periods; and Late Lima – the transition between the Early Intermediate and the Middle Horizon periods). This subdivision could not be done for the Initial, Early Horizon and Late Intermediate periods due to insufficient samples, or in the Late Horizon due to the short duration of the Inca presence in the central coast.

There were some contradictions between the chronological affiliation used in this dissertation and those used by Murphy and colleagues (2010, 2014), Gaither and Murphy (2012), and Lund (2009) for the Puruchuco-57AS03 Inca cemetery. In this study, only adult and adolescent individuals buried in a supine position and in the most superficial levels of the site were considered as "Early Colonial". No infant or child was found in the superficial level. Tombs of adults and adolescents placed in a sitting position (regardless the wrapping style, orientation, and associated goods), and of infants and children excavated into lower levels (both in sitting or lying posture) are considered to be from the Late Horizon Period.

While Cock links the differences in the funerary pattern to chronological changes (Late Horizon vs. "transitional" burials) (Lund 2009:27), I suggest that these differences could reflect social status differences instead. The reason for this is that the chronological difference hypothesis is not supported by the stratigraphic position of the individuals, since the majority of the tombs where found in the same level (see Gamboa and Cock 2008:27). However, the most noticeable difference in the chronological assignment is that this dissertation discards two individuals (T449, included in Murphy et al. 2010, 2011, 2014; and T460, used by Lund 2009) who were clearly from an earlier chronological period, judging from their lower stratigraphic position and their association with ceramics of the White-on-Red and Early Lima styles (Gambia and Cock 2008:75-78, 98-101, 149-150).

4.3.3 Social Status Assignment

This research project assumes that funerary patterns reflect the social structure in which the individuals lived (cf. Binford 1971; Saxe 1971). However, it also acknowledges that this representation is not simple, as many factors converge to shape the relation between the living society and the dead individual (e.g. Braun 1981; Hodder 1980; O'Shea 1981, 1984; Parker Pearson 1982, 1993, 1999; Shanks and Tilley 1982).

Each individual was assigned to one social status category. These categories were created by combining the quality and quantity of the grave goods associated with the individual, assuming that the highest status persons were buried with more and the most prestigious objects[81] (Brown, 1981; Wason 1994), as ethnohistoric documents for the area suggest (e.g. Cieza de León 1996:197 [1553]). The prestige of the funerary objects was assigned following previous funerary studies in the region or the specific archaeological site, such as Kaulicke (1994) for the Initial Period and Early Horizon, Makowski (2002b) for Tablada de Lurín, Barraza (2000) for the Lima, Mac Kay (2007) for Huaca 20, Kaulicke (1997) for Ancón, Díaz (2004) for Armatambo, and Murphy (2004) for Puruchuco-Huaquerones. This information was adapted to create a maximum of three social status categories (low-middle-high) for each time period (Table 4.2).

In the case of tombs with multiple bodies, if a clear association between certain goods and a specific individual could not be established, all the individuals buried together received the same social status category. Following Millaire's (2002) analysis of Moche funerary patterns, individuals located outside the main chamber, with an unusual body position (e.g., not sitting-flexed) and/or with evidence of delayed burial or of possible sacrifice were classified as retainers. This treatment was only evident in the samples of Tablada de Lurín and Ancón. Infants and children accompanying adults (but with no evidence of having been sacrifices or retainers) received the same social status category than the adults as it is possible that young individuals did not receive the same goods as the adults, as Tomasto (1998, see also Tomasto and Makowski 2007) reported for Tablada de Lurín.

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[81] Available information about the funerary contexts studied in this research was in many cases limited to the associated goods. The absence of data regarding body treatment and grave elaboration made it difficult to use a "relative energy expenditure" approach (see Millaire 2002).

Table 4.2: Social Status Categories Used in this Dissertation

<table>
<tr><th></th><th>Initial Period</th><th>Early Horizon</th><th>EIP (White-on-Red)</th><th>EIP (Middle Lima)</th><th>MH1 (Late Lima)</th><th>MH 2-4</th><th>LIP</th><th>LH/ Early Colonial</th></tr>
<tr><td>High Status</td><td></td><td>Feather garments and gold objects</td><td>Four to twenty-two items. Weapons, gilded-copper objects, foreign vessels, metal head-dresses, semi-precious stones</td><td>Exotic feathers, Spondylus, semi-precious stones</td><td>Nievería and Black Maranga ceramics</td><td>Foreign ceramics Spondylus, exotic feathers, sumptuary metallic objects, ear spools, bundles with false heads wigs, weapons</td><td>Nectandra seeds, shell beads, feathers, sumptuary metallic objects, scultoric vessels, 10+ ceramics, Spondylus, Conus, Ostreas</td><td>Elaborate bundles with false heads; & different sumptuary offerings (e.g. Spondylus, metal)</td></tr>
<tr><td>Middle Status</td><td></td><td></td><td>More than two items. Typical associations for each sex</td><td colspan="4">Low quality metal plates or small copper objects</td><td>Elaborate bundles with no false heads. Metal, nectandra seeds, feathers, ceramics, & Spondylus or Pecten</td></tr>
<tr><td>Low Status</td><td colspan="2">Few or no bone instruments, stone artifacts, and ornaments</td><td>Fewer than two items. Common associations and ornaments</td><td colspan="5">Few or no bone, stone, or ceramic objects</td></tr>
</table>

In the specific case of Pueblo Viejo-Pucará, since the funerary contexts contained few offerings, a social status category was assigned to each architectonical complex based on the objects found within and that category was therefore given to all the individuals buried inside. The only exceptions were four individuals (two perinatal, one young child and a young female) that could have been sacrificed during the construction and remodeling of the architecture (Habetler 2007; Hernández 2008).

4.3.4 Trauma Analysis

For this dissertation only fractures, mutilations, traumatic dislocations, and periosteal new bone formation (PNBF) that could be clearly related to traumatic events were analyzed.

The skeletal material was analyzed following classic bioarchaeological and forensic methods presented in summary form in Chapter 2 (e.g. Galloway 1999; Lovell 1997, 2008; Martin and Harrod 2015; Merbs 1989; Walker 2001; and Wedel and Galloway 2014), complemented with other variables such as lethality (Baraybar and Gasior 2006; Lund 2009) and minimum number of events (MNEv). Plain film X-rays were requested for some individuals from Cerro Culebra and Armatambo-22 de Octubre as a complementary technique when gross examination was not enough to complete a description; specifically, in cases were hair was still present.

Following the methodology proposed by Galloway (1999) (see also Wedel and Galloway 2014), traumatic lesions were described using the following categories: a) timing b) measurements c) location d) characteristics and e) causative mechanism.

For La Capitana and Puruchuco-57AS03, where the material was not analyzed directly, the information was corroborated by examining the photos, whenever possible. There were only two cases of disagreement between Kolp-Godoy's and Palma's description and the assessment presented here. In the first, (Individual 03) the authors reported the presence of two rib fractures of accidental origin. However, the photos show a mix of severe lytic lesions and diffuse sclerotic reaction (with subsequent pathological fracture in one of them). These lesions seem to have an infectious origin, which could be corroborated by the presence of PNBF in both tibias and fibulas. In the other case (Individual 35), porotic lesions at the sternal ends of some ribs of an infant were described as PNBF. In the case of Puruchuco-57AS03, Lund's descriptions were preferred due to her vast experience in the analysis of trauma, especially from forensic material. Lesions identified by Murphy and Gaither but not by Lund where recorded as "possible trauma". Unfortunately, there were few reliable data available about antemortem trauma in the adults from Puruchuco.

After the basic description, a "most probable cause" (following Galloway 1999; Lovell 1997, 2008; Merbs 1989; Molto 2015; and Wedel and Galloway 2014) was inferred, according to the classification outlined here:

a) Malintent trauma: This category includes trauma to the skull, teeth, parry fractures[82], and boxer's fractures[83] (fourth or fifth metacarpal shaft). Skull fractures were divided into vault fractures (parietals, occipital, temporals, sphenoid, and upper part of the frontal bone – "hat brim line") and facial fractures (facial bones, including the periorbital area of the frontal bone). For the identification of possible cases of child abuse and domestic violence, I followed the criteria presented in Tables 2.8 and 2.9 (see Chapter 2). Projectile wounds and sharp force trauma are also included in this category. If more than 25% of the vault, face, distal half of the ulnar shaft, uniradicular tooth crown, or more than one of the fourth or fifth metacarpals was missing, the observation was left as "unobservable" in each of these categories. If the observation was unobservable in the vault, face, or forearms, the overall estimation of malintent trauma in an individual was also considered "unobservable" (unless trauma in the other categories were found).

b) Accidental trauma: In the same way that cranial and parry fractures are taken by most researchers as signs of violence, the presence of wounds in other areas of the skeleton are seen as probable products of accidents. The exception to this is the rib cage, which is usually considered a "blurry area" between accidental and violent causes; and specific fractures related to repetitive activities. The category

[82] Following Judd (2008:1661), the diagnosis for parry fractures included fractures in the ulnar shaft that presented these characteristics: "1. the absence of radial involvement, 2. a transverse fracture line, 3. a location below the midshaft, and 4. either minor unalignment (≤10) in any plane or horizontal apposition from the diaphysis (<50%)."

[83] This kind of fracture results from hitting an object with a closed fist. According to Greenspan and Beltran (2015:259), "Boxer's fracture is a fracture of the metacarpal neck with volar angulation of the distal fragment. It may occur in any of the metacarpal bones but is most commonly seen in the fifth metacarpal". The shaft of the fourth metacarpal is also commonly affected (Soong et al. 2010). Rarely, the second or third metacarpal are damaged.

was described as “unobservable” when more of the 25% of the postcranial skeleton was missing or if more than the 50% of the hand and foot bones were absent.

c) Occupational (“stress” fractures): Related to repetitive activities. This includes spondylolysis (pars interarticularis of L5 or L4), march fracture (second or third metatarsal shaft), and Clay shoveler’s fracture (spinous process of a lower cervical vertebra, usually C7). In the absence of L5 or one of the second or third metatarsal, the description was left as “unobservable”.

d) Unknown cause: This category includes fractures on ribs, which are difficult to assign to a most probable cause, especially if they are isolated. For example, fractures on ribs in modern cases can have different origins, such as motor vehicle accidents, falls, direct blows to the chest, coughing, and child abuse (Galloway 1999; Wedel and Galloway 2014). However, fractures in the first three ribs (especially in the first) are more associated with extensive (and in many cases fatal) lesions that include assaults and falls (Wedel and Galloway 2014). In order to give a conclusion about the “presence “or “non-presence” of this kind of trauma, 75% or more of the ribs must be complete.

Another variable that was used is “lethality” (modified from Baraybar and Gasior 2006; and Lund 2009). The categories were created correlating the location and characteristics of the fractures found in the skeleton to clinical and forensic studies to estimate how potentially lethal a wound could be. Lesions with the highest lethality rates include bones that protect vital organs (e.g. cranial vault, ribs, and sternum), followed by severe lesions on the upper one-third of the arm and thigh, which can harm the brachial and femoral arteries, leading to a severe blood loss (Baraybar and Gasior 2006; Galloway 1999; DiMaio and Dana 2007; Wedel and Galloway 2014).

The variable, “lethality”, is not intended to be a determination of the cause of death of the individual, but an assessment of the intention of the perpetrator to wound or kill their victim. In this way, although all antemortem fractures are essentially non-lethal, their location and extension could tell about the nature of violence, as a hit to the nose is not as harmful as a blow to the back to the skull. In the same way, although perimortem fractures could be linked to the cause of death of an individual (especially those located in the cranial vault), multiple injuries could be related to a more violent scenario than an isolated wound.

Following these criteria, five categories (modified from Baraybar and Gasior 2006; and Lund 2009) were created for use in this study:

- Lethality I (low): Antemortem fractures in the facial bones, teeth, and postcranial skeleton (except by ribs and severe fractures to the pelvis and the proximal one-third of the femoral or humeral shafts).

- Lethality II (medium): Small (less than one cm) antemortem fractures to the vault (including the frontal bone), multiple or severe antemortem facial fractures, antemortem fractures affecting one or two ribs, and severe antemortem fractures in the femoral or humeral shafts.

- Lethality III (high): Medium to large (one or more cm) antemortem fractures to the vault (including frontal bone), severe antemortem fractures in the pelvis, and healed fractures involving three or more ribs.

- Lethality IV (fatal): Perimortem fractures (or antemortem but close to death injuries) affecting only the skull, cervical vertebrae, ribs or the proximal one-third of the humeral or femoral diaphysis.

- Lethality V (fatal, extremely violent): Multiple perimortem (or close to death) fractures affecting the skull, or the skull and other parts of the skeleton.

Finally, a “minimum number of events” (MNEv) was established and defined, considering the different stages of healing of the lesion (modified from Delabarde 2008a:237): a) perimortem fractures with no macroscopic signs of healing b) antemortem (close to death) fractures with sharp or smooth edges and little reactive bone formation c) fractures with moderate to considerable bone proliferation d) healed fractures (no active bone formation).

4.3.5 Statistical Analysis

This dissertation presents prevalence of fractures for each chronological period, divided by age cohort, most probable cause, location, lethality, minimum number of events (MNEv), and social status. Prevalence is essentially a relative frequency, which indicates the percentage of certain pathology (in this case, trauma) in a sample. The calculation of the prevalence follows Law's (2005) and Waldron's (2009) guidelines; which indicate that in order to calculate the overall prevalence of a pathology in a population, the total number of cases with at least one lesion serves as the numerator, while the denominator is given by the total number of observable cases. In other words, individuals with missing or damage areas should not be included in the calculation (for example, skeletons with badly preserved skulls were not counted for the estimation of malintent trauma). In this dissertation, "prevalence" will exclusively refer to any calculation that only considers observable cases. Calculations that also consider non-observable cases are referred as "percentage" or "rate". In this study, a prevalence 10% and below is considered "very low", between 11 and 20%, "low", between 21 and 30%, "moderate", between 31-50%, "high", and above 50%, "very high". These arbitrary categories were constructed based on the prevalence of malintent/cranial trauma reported in the different studies presented in Chapter 2 and 3.

Odds ratios were used to assess significant differences between samples in trauma prevalence by cohort, social status, and chronological period. The odds ratio is a non-parametric measure of association (like the Chi-Squared or G-tests) commonly used in epidemiological contexts that provides a statistic and a 95% confidence interval (Bland and Altman 2000). In this case, it was used to determine if the prevalence of a particular variable (e.g. cranial trauma) in one sample (e.g. males) was associated with the prevalence of that variable in a second sample (e.g. females). An odds ratio of 1 suggests that there is no difference between the two subject groups in terms of the variable being tested. Odds ratios greater than 2 (and with a 95% confidence interval (CI) that does not include 1) are considered to indicate that there is no association between the two subject groups in terms of the variable being tested (that is they are statistically significantly different) (Waldron 2009). Conversely, odds ratios less than 2 (and with a 95% CI that includes 1) are considered to indicate an association between groups. Odds ratios are increasingly being used as a statistical tool in bioarchaeology (e.g. Digangi and Hefner 2013; Klaus 2014; Waldron 2009; Zeigler et al. 2016). The calculation of odds ratios was done using MedCalc statistical software (https://www.medcalc.org/calc/odds_ratio.php, accessed November 12, 2015), a friendly on-line resource that provides similar results to IBM SPSS Statistics software.

Chapter 5

5 Results, Part I: Analysis of the Samples

This chapter details the results of the analysis of the 736 individuals from the pre-Hispanic and Early Colonial periods that compose the main corpus of this study. The chapter is divided into chronological periods, each of which presents the paleodemographic reconstruction of the samples and the prevalence of fractures divided by age cohort, most probable origin, location, lethality, minimum number of events (MNEv), and social status. Discounting some isolated cases of dislocations, fractures were the only kind of trauma found. As was already stated in Chapter 4, “prevalence” will exclusively refer to any calculation that only considers observable cases. Calculations that also consider non-observable cases are referred as “percentage” or “rate”. The goal of the presentation of some variables in terms of rates/percentages and prevalences is to let the reader see how poor preservation (that produced a variable number of “non-observable” cases) could produce unusually high prevalences of trauma. This distinction is only used in the calculation of the general percentage of fractures and the percentage and prevalence of malintent trauma. Odds ratios that indicated statistically significant associations between variables are underlined; associations that were not statistically significant are not (see Waldron 2009). The next chapter (Results, Part II) compares the results presented in this first part with those obtained by other researchers on the central coast (see Chapter 3) and other Andean regions in the same chronological periods.

Each section (arranged by time period) presents the following chart:

1) Demographic profile (sex and age distribution), which presents the number of individuals present in each age cohort)

2) General percentage of fractures in adults (divided by sex) and subadults, presenting the percentage of individuals with at least one fracture, the percentage of individuals with no fractures, and the percentage of individuals in which the assessment of presence/absence of fractures was no possible due to poor preservation.

3) General percentage of fractures divided by age cohorts. It presents the same results of the above chart, but divided by age cohorts.

4) Prevalence of fractures divided by its most probable cause among adults (divided by sex) and subadults. Each column shows the prevalence of certain kind of fracture in males, females, and subadults, and they should be interpreted independently. For example, a column indicating 20% of malintent trauma in males should be read: “20% of the males presented malintent trauma”. The results of the columns do not add to 100%, as a single individual could present one or all the kinds of fractures at the same time. Similarly, not always all the kind of fractures were observable in a same individual.

5) Prevalence of types of fractures (according its most probable cause) among the different age cohorts. It presents the same results of the above chart, but divided by age cohorts.

6) Prevalence of accidental and occupational fractures by anatomical location in adults (divided by sex) and subadults. It does not tell what percentage of accidental and occupational fractures were located in a specific anatomical area, but the prevalence of fractures located in certain area of the skeleton in males, females, and subadults. For example, a column indicating 25% of feet fractures in females should be read: “25% of the females presented fractures on the feet”.

7) Percentage of malintent trauma in adults (divided by sex) and subadults. Includes non-observable cases.

8) Prevalence of malintent trauma by anatomical location or type of fracture among adults (divided by sex) and subadults. It does not tell what percentage of malintent trauma were located in a specific anatomical area, but the prevalence of fractures located in certain area of the skeleton in males, females, and subadults. For example, a column indicating 10% of Parry fractures in subadults should be read: “10% of the subadults presented Parry fractures”.

9) Lethality of the fractures in adults (divided by sex) and subadults. It presents the prevalence of fractures according to their lethality. If an individual presented fractures of

different lethality (e.g. lethality II and V), only the highest lethality was recorded. It also includes the prevalence of individuals with no fractures (recorded as “lethality 0”).

10) Minimum Number of Events in adults (divided by sex) and subadults. It includes observable and non-observable cases.

11) Social status distribution in adults (divided by sex) and subadults (if relevant). It indicates the number of individuals in each social status category.

12) Prevalence of trauma in adults by social status (if relevant). Each column shows the prevalence of certain kind of fracture among adults of different social status. For example, a column indicating 40% of malintent trauma in the low status group should be read: “40% of the low status individuals presented malintent trauma”.

These variables were selected to answer the questions addressed in the Introduction of this dissertation and at the end of Chapter 3. The division by cohorts allows to see if there is any difference in how men and women, and adults and subadults experienced violence in the different time periods. Similarly, the analysis of the prevalence of malintent trauma by social status could help to establish if low status people were more affected by violence, as was hypothesized earlier. Knowing the segments of the society that presented more malintent trauma, the specific location (e.g. facial bones, posterior part of the skull, parry fracture, etc.) and the lethality of the lesions, as well as the MNEv, it is possible to suggest what manifestation of violence (e.g. battles, massacres, raiding, domestic abuse, etc.) was behind those injuries, and if those events were isolated or not.

The comparisons of the results of each time period will establish how violence evolved through time. If different patterns in the prevalence of malintent trauma rise and fall from one period to the next, then the main null hypothesis that there are no differences in the prevalence of trauma over time will be rejected.

5.1 Initial Period and Early Horizon (Formative Period)

Five samples were analyzed from the Formative period: one from the Rímac Valley (La Capitana), two from the Mala Valley (León Dormido 3 and León Dormido 17), and two from the Omas Valleys (Asia and Asia Baja).

The Rímac Valley sample was composed of a single site of the Initial Period, La Capitana (n = 34). The data used here are based on Kolp-Godoy's and Palma's (2009) study of the individuals that were recovered by Enriquez and her team in 2005.

The age and sex distribution of La Capitana showed that the sample was composed mostly of adults (61.8%, n = 21), especially young and middle adult males (32.4%, n = 15) (Figure 5.1).

At least 38.5% (n = 5/13) of the males and 25% of the females (n = 2/8) presented one or more antemortem fracture (Figure 5.2). The percentage of fractures (including non-observable cases) was very similar among the adults (40-50%), except for the middle adult females, who demonstrated no trauma cases (Figure 5.3). The most common type of trauma both in males and females was accidental fractures (66.7% – n = 2/3 in females and 42.9% – n = 3/7 in males, odds ratio = 2.67 – 95% CI 0.16-45.14); with the young and old females the most affected. Nevertheless, only males also presented other kinds of fractures (such as malintent and occupational fractures). No rib fractures were identified (Figures 5.4 and 5.5). With regard to accidental and occupational traumatic lesions, the areas that were most commonly affected in males were the upper limbs, feet, and spine (~15-20%), while in females, the most commonly affected regions were the lower limbs and the spine (~15%) (Figure 5.6).

Two possible malintent antemortem fractures were detected in two young males: one in the right second to fifth metacarpals (boxer's fracture)[84] and the other in the right side of

[84] This is not a "typical" boxer's fracture. Although the involvement of the second and third metacarpals is rare in this kind of injury, it is still possible. Moreover, the way in which the neck of the fifth metacarpal is affected is typically found in lesions by punch (see Chapter 4 for Greenspan's and Beltran's (2015) definition of this type of fracture).

the frontal bone. Nevertheless, this type of trauma could not be assessed in 13 of the 34 individuals (seven subadults, five females, and one male) because of the poor preservation of the remains – mainly in the facial area (Figures 5.7 to 5.11). When only observable cases were considered, the prevalence of malintent trauma in males was 16.7% (n = 2/12). No statistically significant difference in the prevalence of traumatic lesions between males and females was found (odds ratio = 1.67 – 95% CI 0.06-43.79).

The lethality of most of the lesions was catalogued as low (I), with just one case of high (III) lethality. None of the individuals presented perimortem trauma (Figure 5.12). The MNEv was predominantly 0, with no cases of repetitive trauma (Figure 5.13).

With regard to social status, 91.2% of the individuals were catalogued as "low status" (n = 31) and the remaining 8.8% (n = 3) were classified as "unknown status" due to the lack of field information (Figure 5.13).

To summarize: despite the fact that more than one quarter of the adult population suffered a traumatic lesion during their lives, the prevalence of malintent trauma was only detected in 16.7% (n = 2/12) of the adult males. The lethality of these lesions was considered low to high, with no cases of repetitive trauma or fatal wounds. However, the poor preservation of the remains and the small number of individuals could be hiding the real prevalence of malintent trauma in this population, especially among females and subadults. No social differentiation was found in this population.

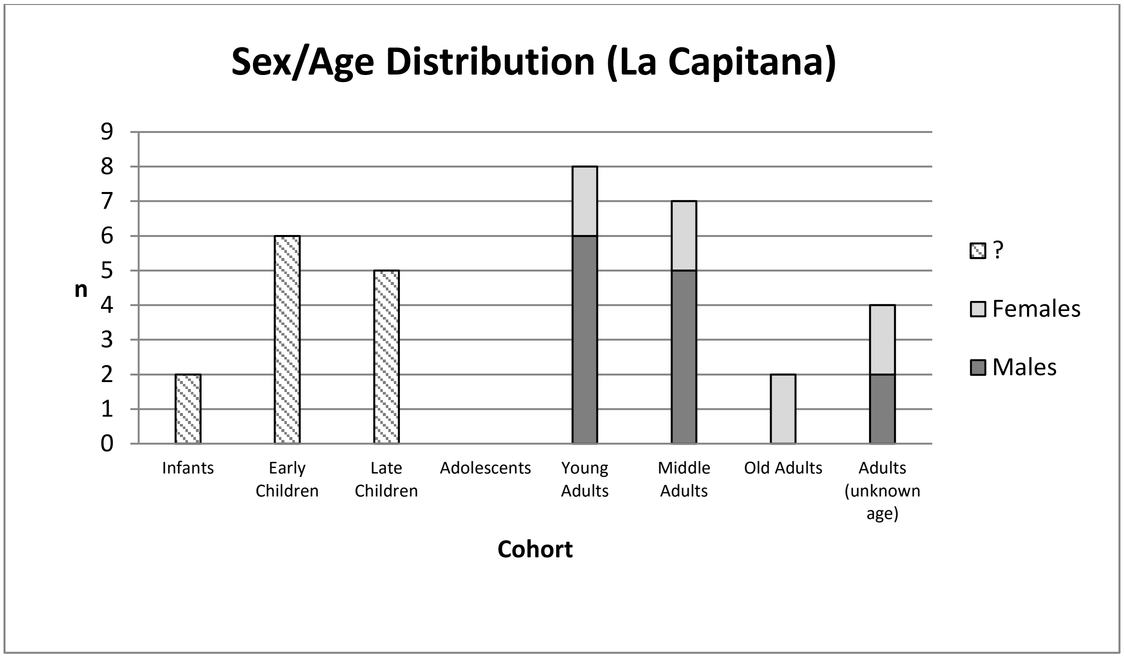

Figure 5.1: Sex and Age Distribution at the Site of La Capitana

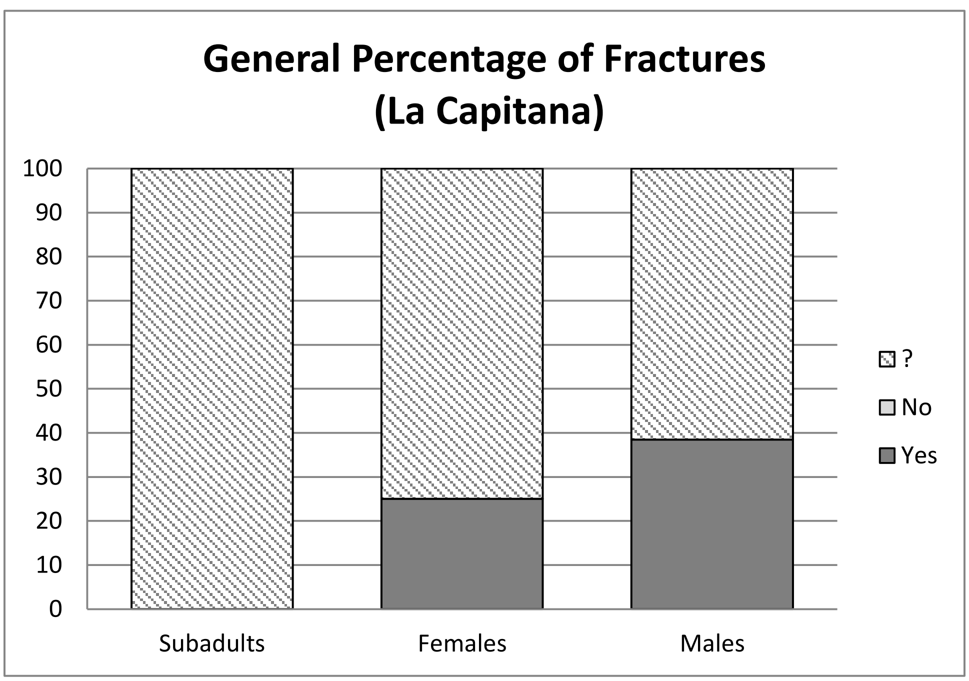

Figure 5.2: General Percentage of Fractures in Subadults, Females, and Males from La Capitana

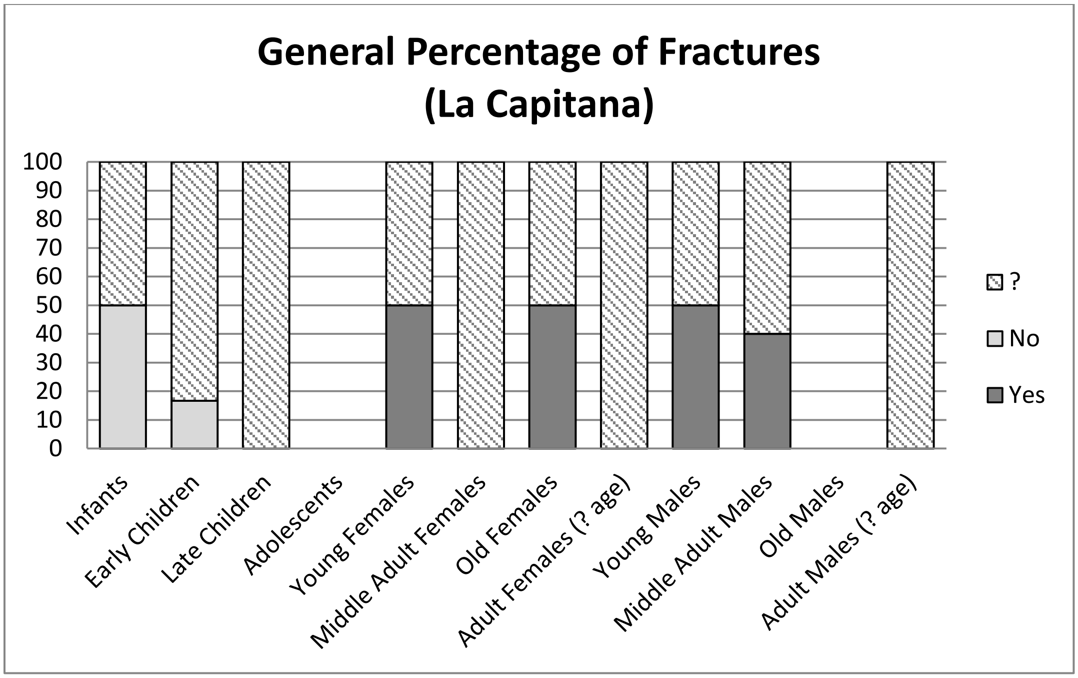

Figure 5.3: General Percentage of Fractures by Age Cohort at the Site of La Capitana

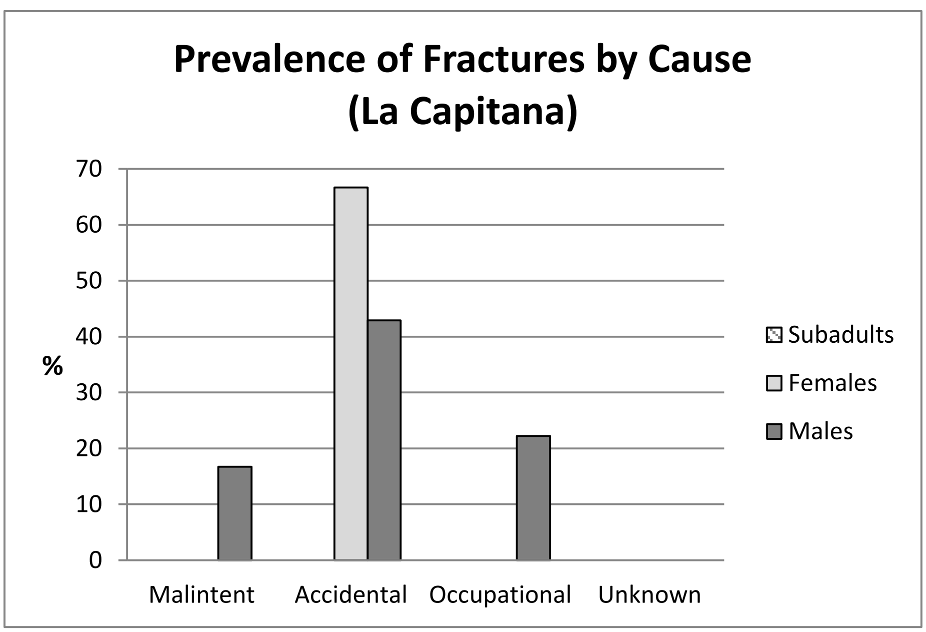

Figure 5.4: Prevalence of Fractures by Most Probable Cause at the Site of La Capitana

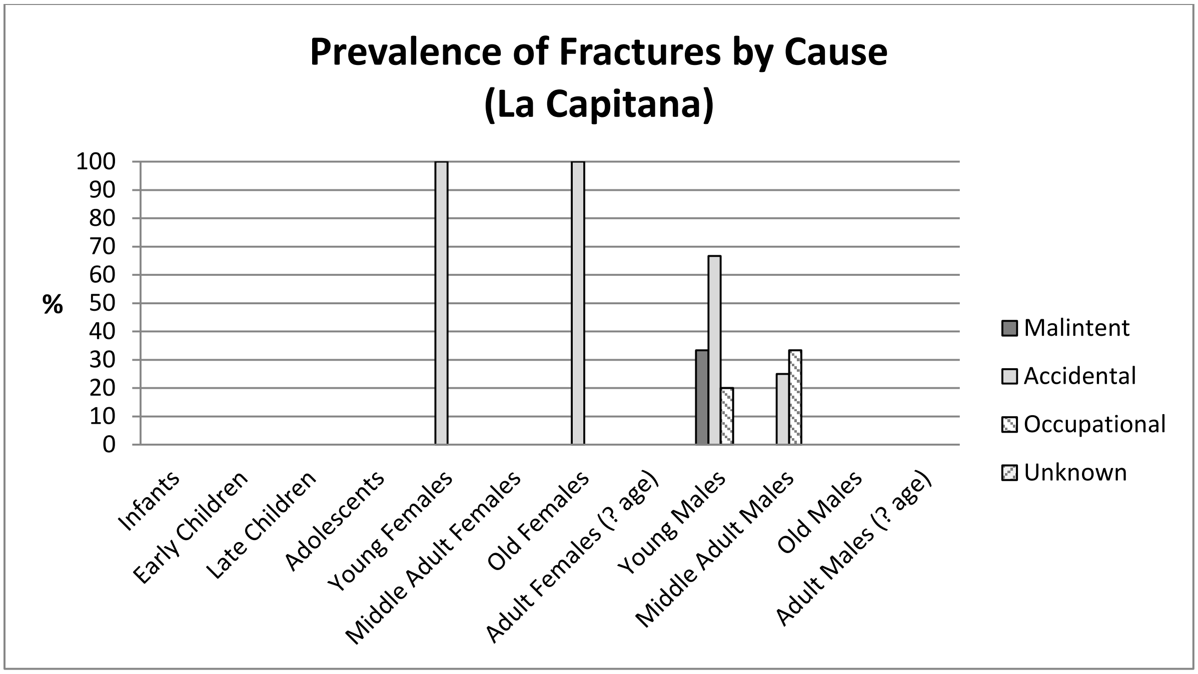

Figure 5.5: Most Probable Cause of Fractures by Age Cohort at the Site of La Capitana

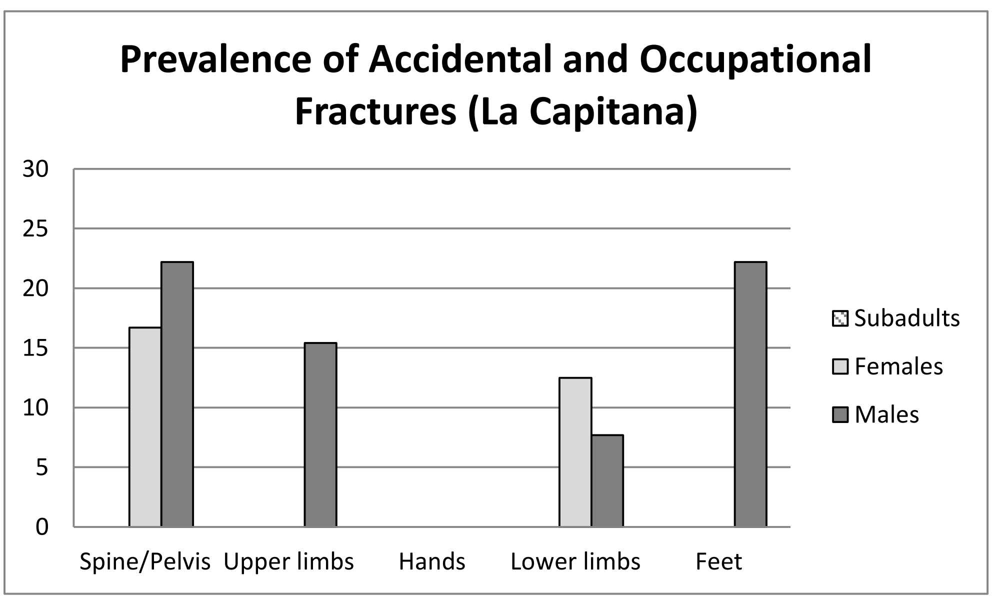

Figure 5.6: Prevalence of Accidental and Occupational Fractures by Location at the Site of La Capitana

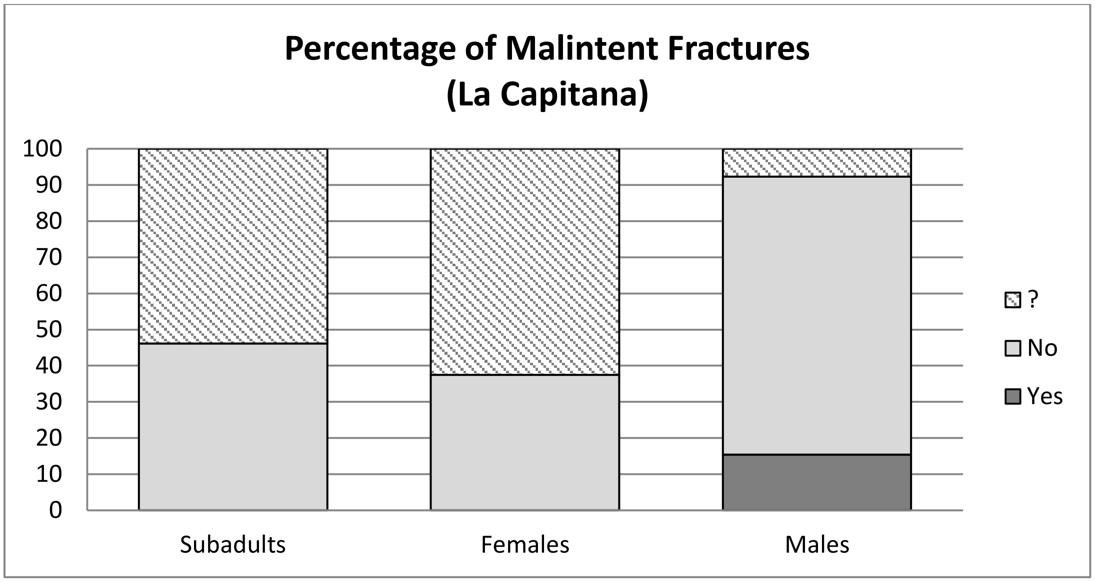

Figure 5.7: Percentage of Malintent Fractures at the Site of La Capitana

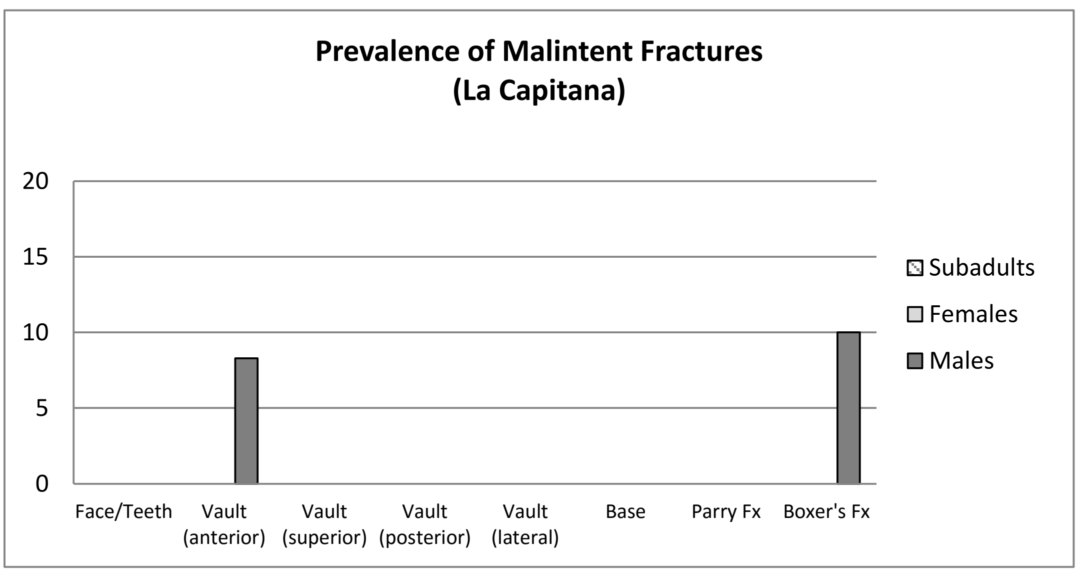

Figure 5.8: Prevalence of Malintent Fractures by Location/Type at the Site of La Capitana

Figure 5.9: Antemortem Fracture on the Right Frontal (La Capitana, Individual 49, Young Male). Photo by Martha Palma

Figure 5.10: Boxer's Fracture on the Right 2nd to 5th Metacarpals (La Capitana, Individual 40, Young Male). Photo by Martha Palma

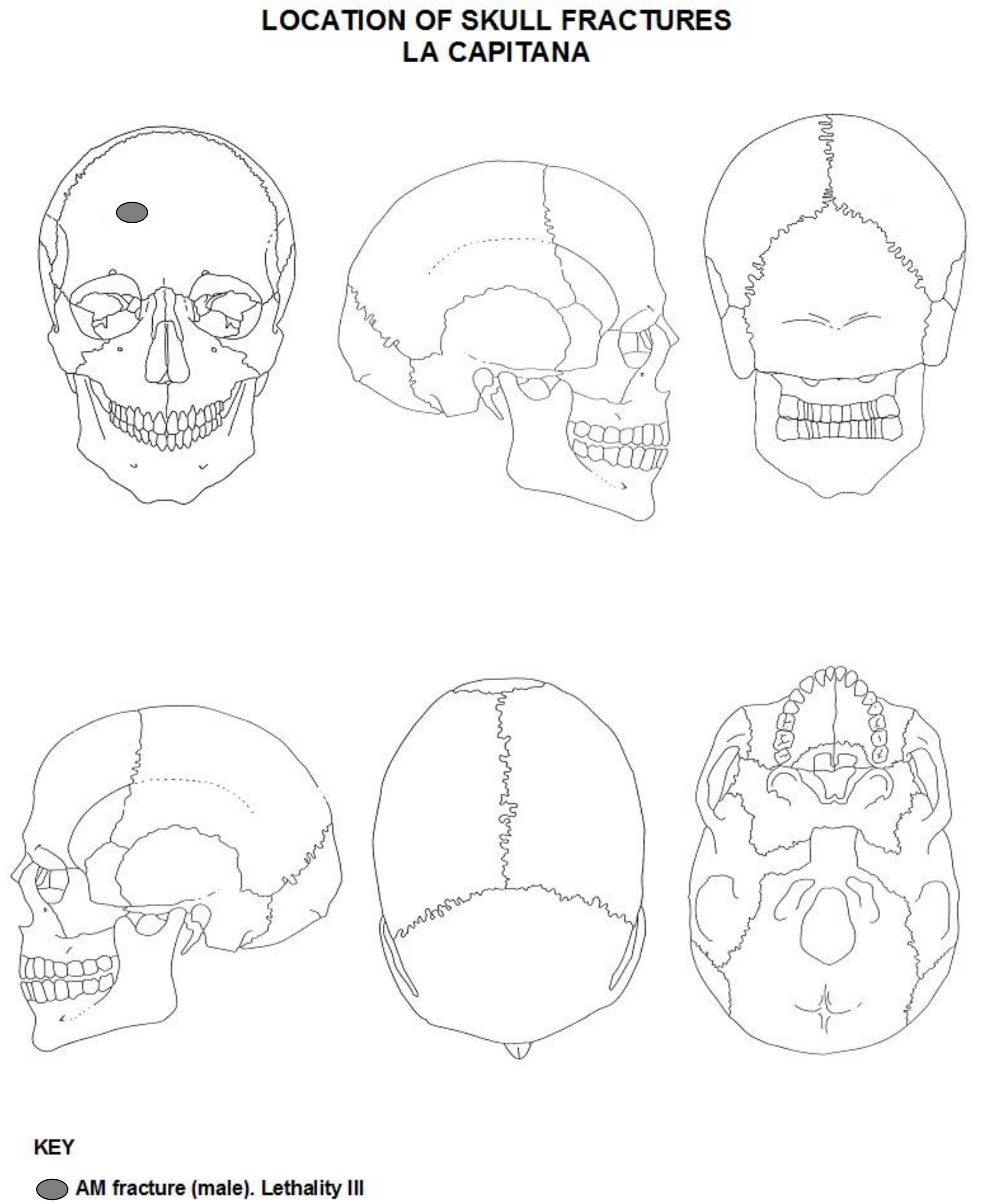

Figure 5.11: Location of Skull Fractures at the Site of La Capitana Based on One Individual. Skull Sketches after Buikstra and Ubelaker (1994)

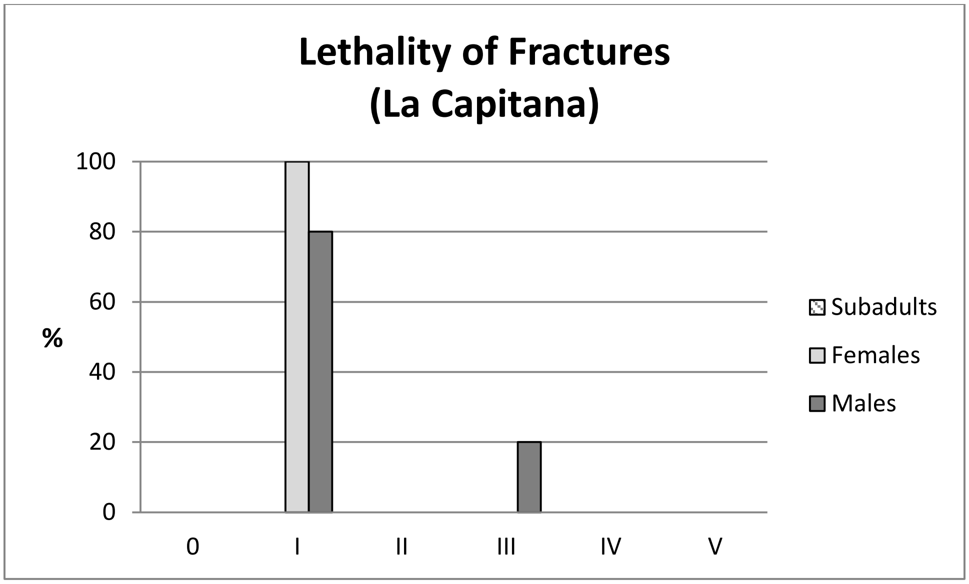

Figure 5.12: Prevalence of Fractures by Lethality at the Site of La Capitana

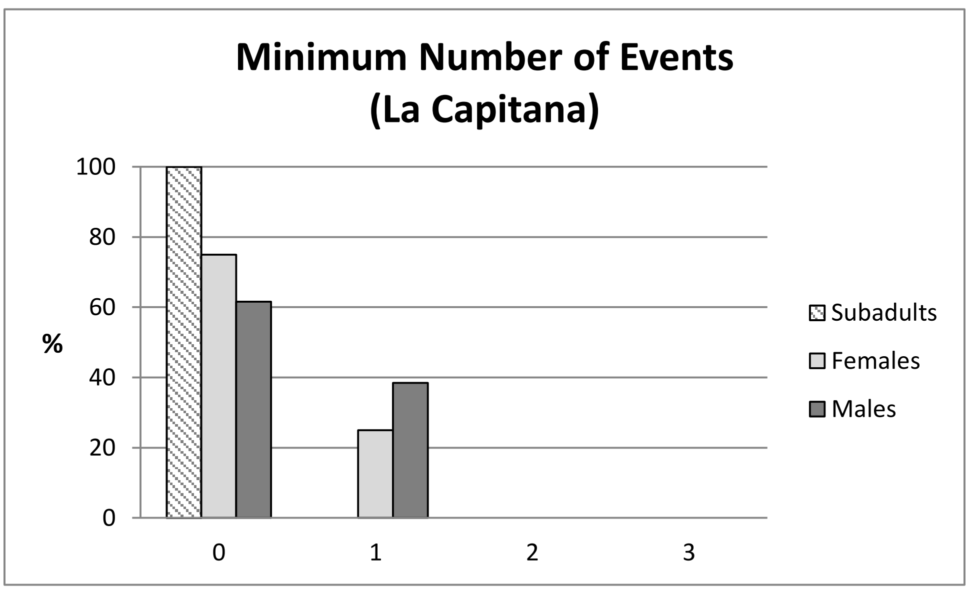

Figure 5.13: Minimum Number of Events at the Site of La Capitana

Asia León-Dormido

The south-central coast sample (Mala-and Omas Valleys) is composed of four sites: Asia (n = 15), Asia Baja (n = 16), León Dormido 3 (n = 6), and León Dormido 17 (n = 7), all of them were directly analyzed by the author[85]. These individuals were recovered during Villacorta's (2005) and Bautista's (2011) salvage excavations. While the individual site samples were too small to give reliable results by themselves, they date from the same chronological period[86] and shared similar funerary patterns. Therefore, they were combined for the purposes of this analysis.

As with the La Capitana sample, the biological profile reconstruction from the Mala-Omas Valleys showed that the majority of the individuals were adults of both sexes (61.4%, n = 27) (Figure 5.14). More than one half of the adults (61.5% – n = 8/13 of the males and 50% – n = 7/14 of the females, including non-observable cases) presented at least one antemortem fracture (Figure 5.15). The highest percentage of fractures was found among the middle adult females (100%, n = 5/5) while the lowest was found in the young adult females group (22.2%, n = 2/9). Young and middle adult males demonstrated broadly similar results (~55-65%) (Figure 5.16). When only observable cases were considered, the most common type of trauma (according to its most probable origin) was accidental fractures in males (87.5% – n = 7/8 vs. 60% – n = 3/5 in females, odds ratio = 4.67 – 95% CI 0.30-73.39) and unknown fractures in females (83.3% – n = 5/6 vs. 25% – n = 1/4 in males, odds ratio = 15 – 95% CI 0.66-339.57), with the highest peak in the middle adult age cohorts (Figures 5.17 and 5.18). Foot bones were more affected in males than in females (71.4% – n = 5/7 vs. 25% – n = 1/4, odds ratio = 7.5 – 95% CI 0.46-

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[85] Part of the Asia Baja, León Dormido 3, and León Dormido 17 samples were analyzed in collaboration with Mellisa Lund and Elsa Tomasto.

[86] While Asia burials were probably from the Initial Period (Early Formative), Asia Baja and León Dormido 3 individuals were associated to Early Horizon (Late Formative) ceramics (Maquera 2010; Oshige and Carbajal 2015). However, León Dormido 17 were more difficult to date, presenting ceramics that were catalogued only as "Formative" (Initial Period or Early Horizon).

122.70). Hand bones were similarly affected (33.4% – n = 3/9 vs. 0% – n = 0/7, odds ratio = 8.08 – 95% CI 0.35-187.34) (Figures 5.19 and 5.20).

There were no cases of malintent trauma. However, the poor preservation (especially of the facial bones) did not allow confident determination of the existence (or non-existence) of this kind of trauma in 22 out of 44 individuals (thirteen subadults, six females, and three males) (Figure 5.21).

As was the case with La Capitana sample, most of the lesions were described as being of low (I) lethality, with three cases of moderate (II) and three cases of high (III) lethality. None of the individuals presented perimortem trauma (Figure 5.22). The MNEv was predominantly 0, with only one case of repetitive trauma (Figure 5.23).

With regard to social status, almost every individual was catalogued as "low status". The exception was an early child (Asia Baja Oeste, CF 15) who was described as a middle status individual[87]. No trauma was found in this individual.

In sum, although more than one half of the adults presented at least one fracture, none of them could be related to violent events. However, the poor preservation of the facial area in many skeletons (especially in females and subadults) could be affecting the results. In males, the majority of the lesions (located more frequently in the foot phalanges) had a probable accidental origin; while in females the most common location of the fractures was the rib cage, probably related to osteoporosis[88], judging by the age of most of the affected women. In almost all cases, traumatic lesions were of a low to moderate lethality and non- repetitive. Very little social differentiation was detected in this population.

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[87] Although the original social status descriptions (see Chapter 4, Table 4.2) does not include a middle status category for this period, the presence of copper ornaments in this burial (see Bautista 2011:Table 6-12) suggests that this child possessed a higher status than the other individuals.

[88] Cortical bone thickness decreases with age, and even coughing could produce rib fractures in elderly and osteoporotic persons (Galloway and Wedel 2014c).

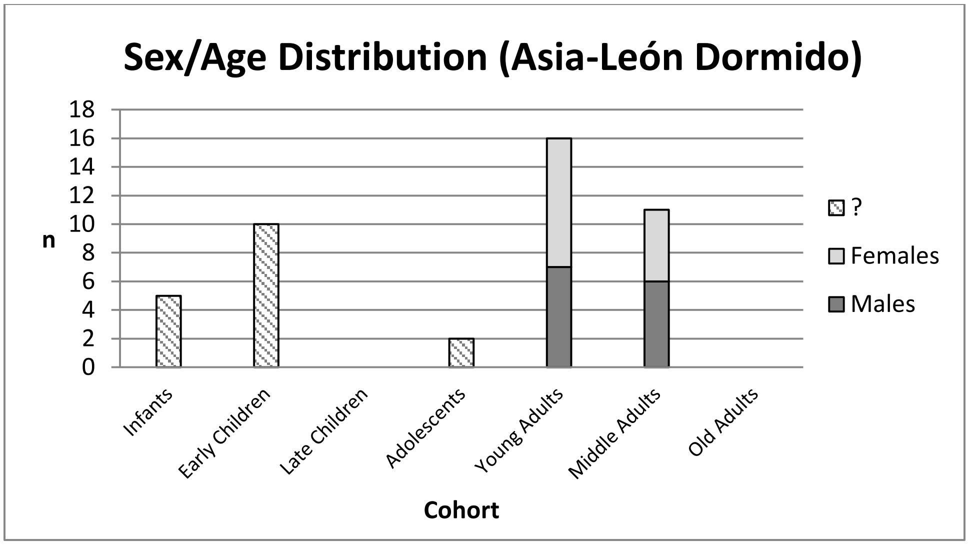

Figure 5.14: Sex and Age Distribution at the Sites of Asia-León Dormido

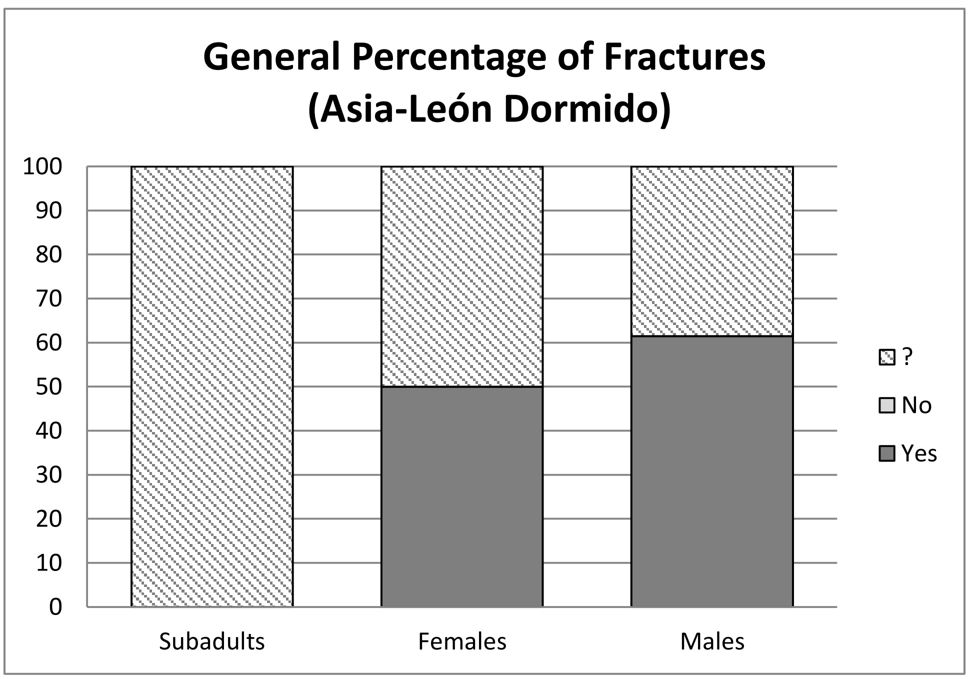

Figure 5.15: General Percentage of Fractures in Subadults, Females, and Males from Asia-León Dormido

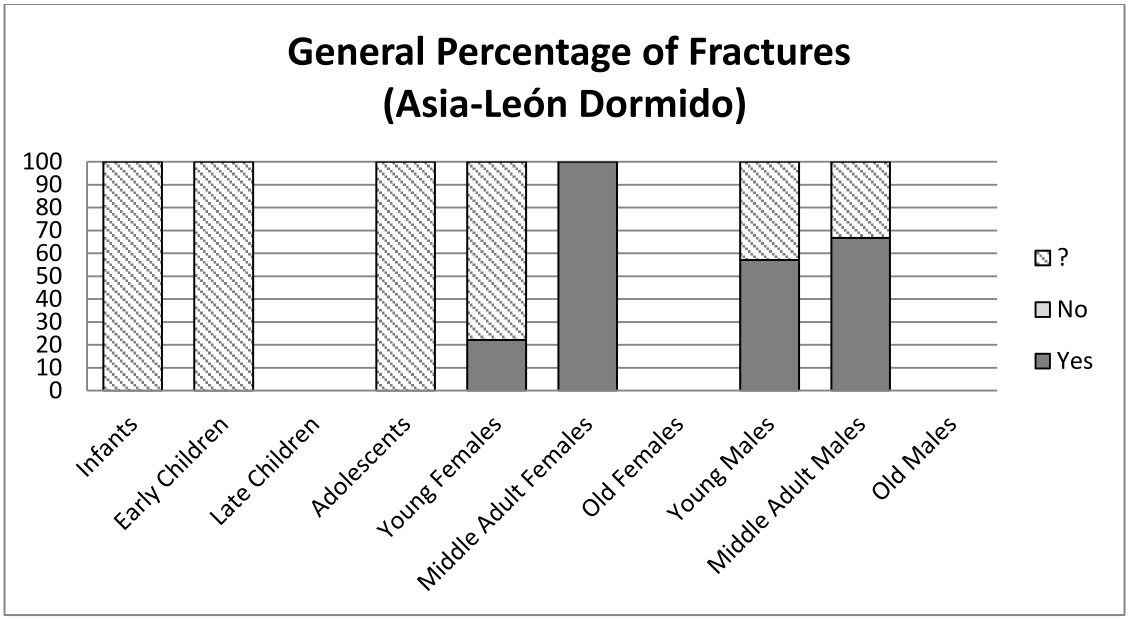

Figure 5.16: General Percentage of Fractures by Age Cohort at the Sites of Asia-León Dormido

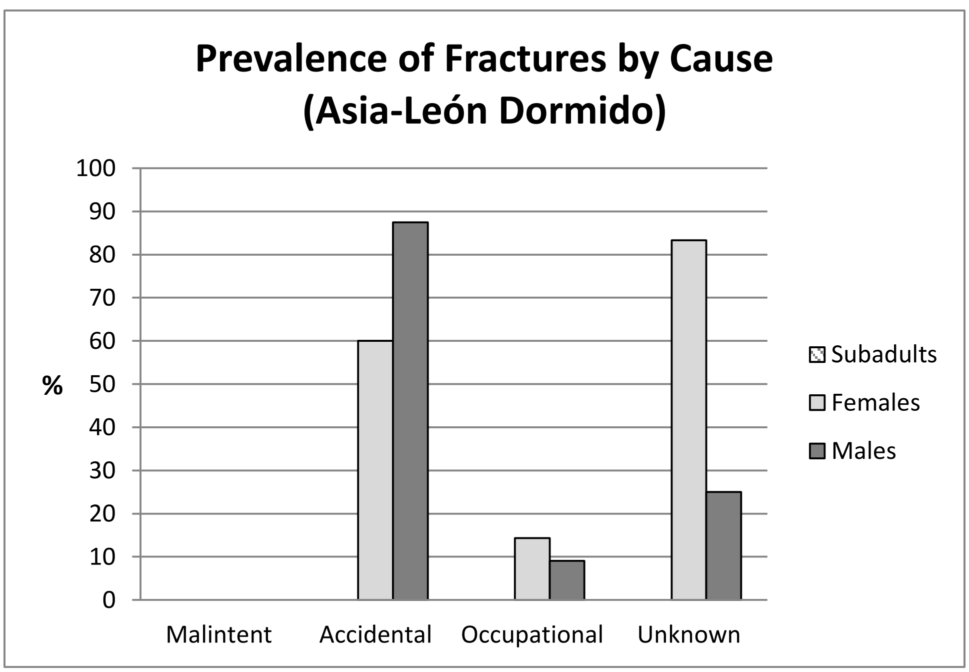

Figure 5.17: Prevalence of Fractures by Most Probable Cause at the Sites of Asia-León Dormido

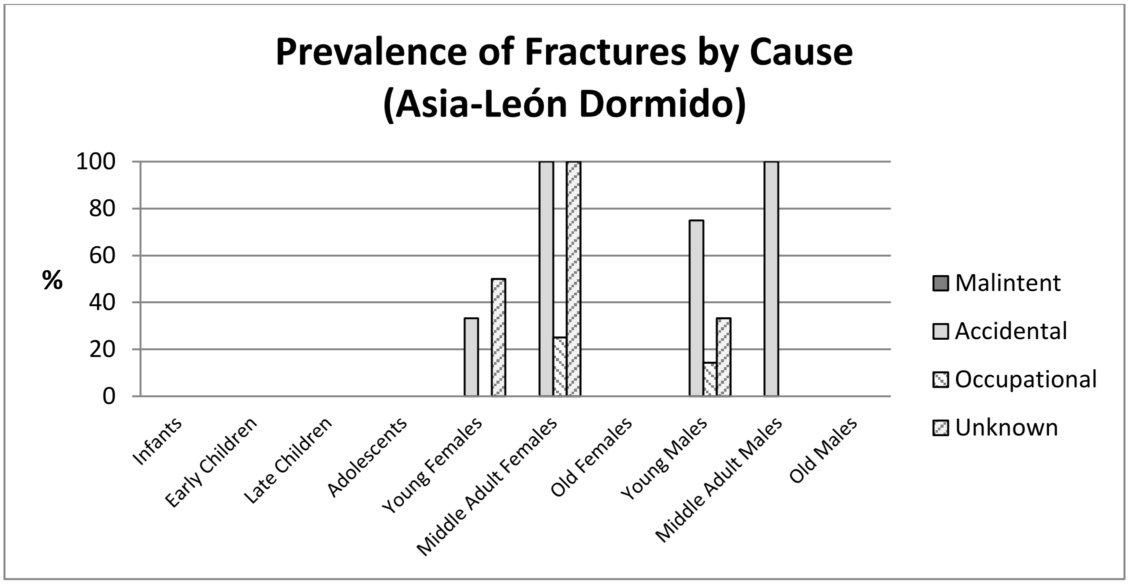

Figure 5.18: Most Probable Cause of Fractures by Age Cohort at the Sites of Asia-León Dormido

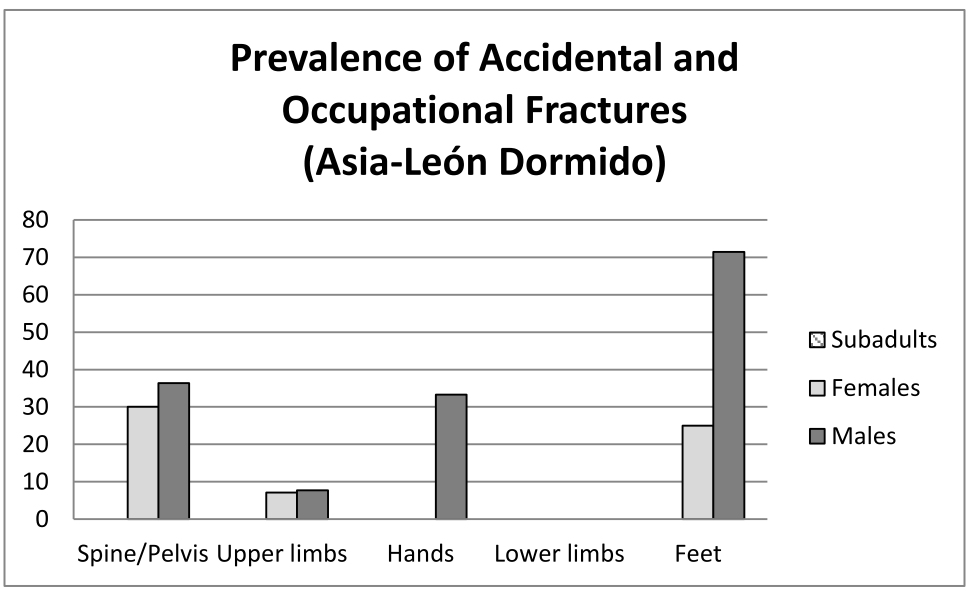

Figure 5.19: Prevalence of Accidental and Occupational Fractures by Location at the Sites of Asia-León Dormido

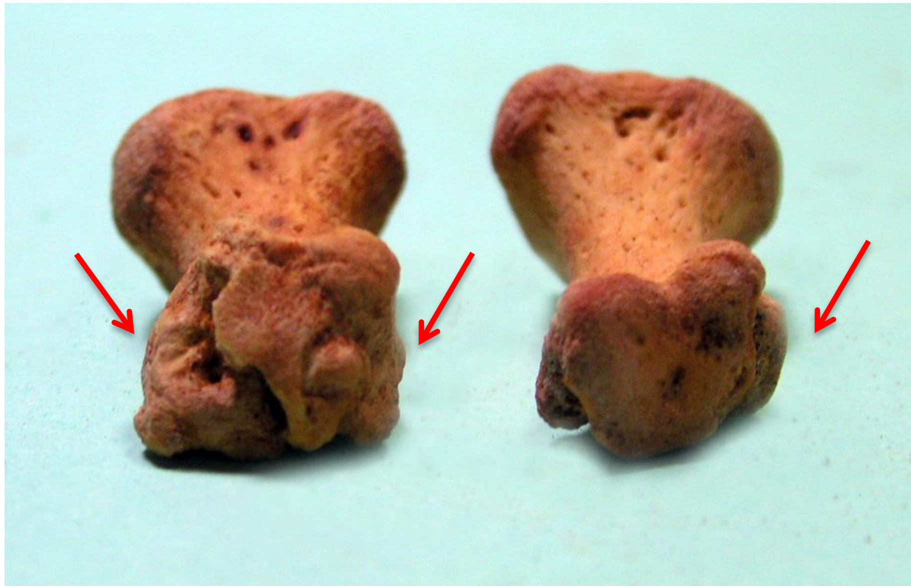

Figure 5.20: Antemortem Fracture of the 5th Proximal Phalanges of Both Feet (León Dormido 17, CF 6, Middle Adult Male). Photo by Elsa Tomasto

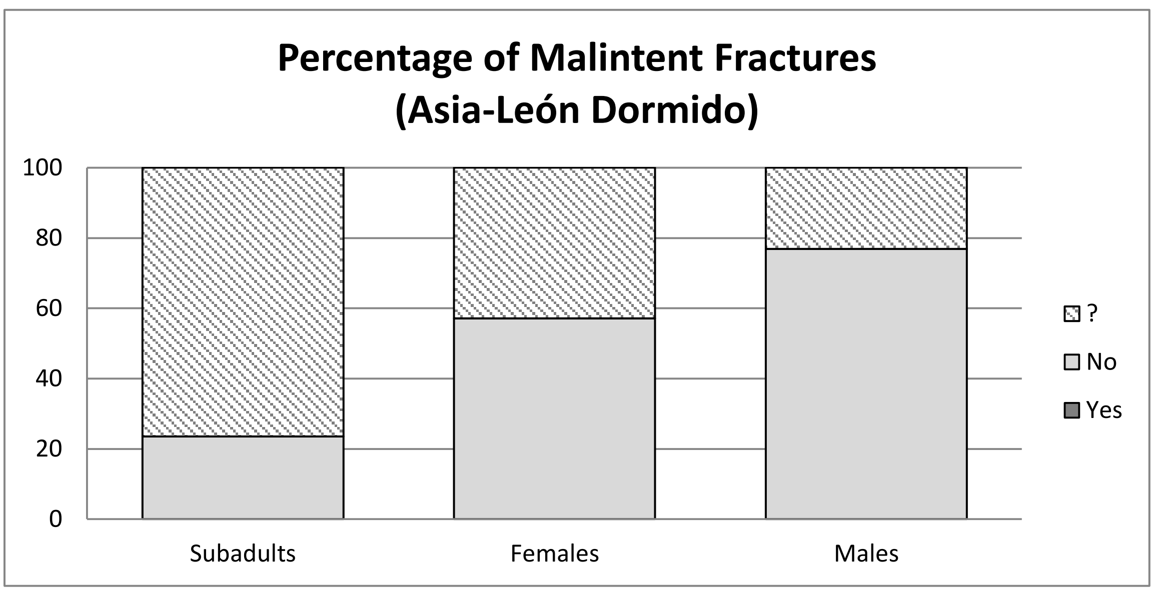

Figure 5.21: Percentage of Malintent Fractures at the Sites of Asia-León Dormido

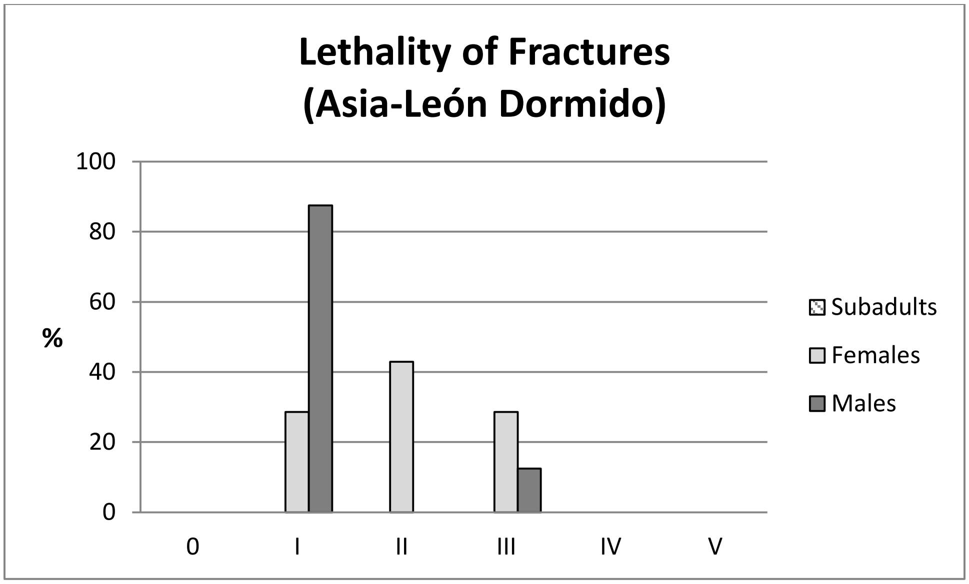

Figure 5.22: Prevalence of Fractures by Lethality at the Sites of Asia-León Dormido

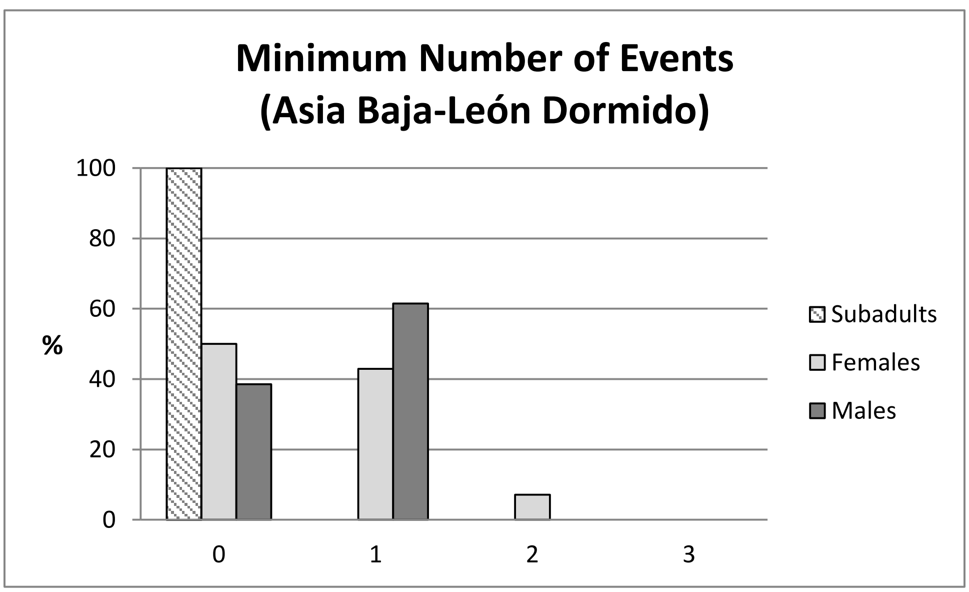

Figure 5.23: Minimum Number of Events at the Sites of Asia-León Dormido

5.2 Early Intermediate Period A (White-on-Red Tradition)

The White-on-Red Tradition was represented by one sample, Tablada de Lurín, which was recovered in the 1990s in the South-East sector (the largest part of the cemetery) by various generations of PUCP undergrad students, under the direction of Makowski. Following prior osteological information gathered by Tomasto, 53 individuals with a fair to good preservation score were randomly selected for analysis, which represents 10% of the 525 individuals recovered by Makowski and his team in that sector.

Contrary to the Formative period, the Tablada de Lurín sample presented an age cohort distribution that was close to what is expected in a pre-industrial population (see Chamberlain 2006; Séguy et al. 2008; Wood et al. 2002): a high rate of infant deaths (43.4%, n = 23), followed by middle adults (18.9%, n = 10) (Figure 5.24).

The percentage of trauma was very high in adolescents and adults. At least 11.4% (n = 4/35) of the subadults – especially adolescents –, and 60% (n = 6/10) of the females and 100% (n = 8/8) of the males presented a least one injury. In other words, more than half of the individuals older than 13 years and every male individual presented at least one kind of fracture (Figures 5.25 and 5.26). The most common type of trauma in adults was unknown fractures (100%, n = 8/8). However, the fragmentation of the ribs left this category as unobservable in many individuals. Accidental fractures followed as the most common type of fracture in both males and females (83. 3%, n = 5/6 and 60%, n = 3/5 respectively) (Figures 5.27 to 5.29). As was seen in the prior period, foot bones were more affected in males (50% , n = 3/6) than in females (14.3%, n = 1/7) (odds ratio = 6 – 95% CI 0.42-85.25). On the other hand, the spine was the most affected area in females (28.6% – n = 2/7 vs. 0% – n = 0/7 in males, odds ratio = 6.82 – 95% CI 0.27-172.3) (Figure 5.30).

The prevalence of malintent trauma was 62.5% (n = 5/8) in males, 25% (n = 2/8) in females, and 6.7% (n = 1/15) in subadults. This kind of trauma was higher in males than in females (odds ratio = 5 – 95% CI 0.58-42.8). However, the fragmentation of the skulls made the observation impossible in 20 out of 35 subadult individuals (Figure 5.31). The majority of malintent lesions in males (3 of 5) were located on the facial/anterior area of the skull, contrary to females, where the only two cases of fracture of cranium were located in the posterior and lateral-posterior area. The prevalence of facial fractures was 37.5% (n = 3/8) in males and 0% (n = 0/8) in females (odds ratio = 10.82 – 95% CI 0.46-252.80) (Figures 5.32 to 5.36).

The only case of malintent fracture in a subadult was found in a female adolescent[89] (15-16 years) who exhibited multiple perimortem blunt force traumatic lesions to the frontal and facial bones (Figures 5.37 to 5.39) and one to the posterior part of the right parietal (Figure 5.40). Additionally, this female presented perimortem mutilation of both forearms, which was probably produced by a long heavy (chopping) weapon (Figures 5.41 and 5.42), and possible perimortem fractures in the bodies of some ribs and in the angle of the left seventh rib. The position in which the body was found (in prone position, isolated, and inside a simple pit with no grave goods) suggests that this individual was the victim of sacrifice or special punishment.

In this time period, lesions were more lethal than in the previous two periods. Most of the fractures in females were described as II or moderate lethality. An old male and an adolescent female demonstrated fatal wounds produced with extreme violence (lethality V) (Figure 5.43). The MNEv was predominantly 1 in the case of adults and 0 in subadults, with some cases of repetitive trauma (Figure 5.44).

Most of the individuals were catalogued as “low status” (64.2%, n = 34), which was not surprising as most of the subadults (the greatest part of the sample) were from this group. The remaining individuals were included in the “middle status” (26.4%, n = 14) or in the “high status” (7.5%, n = 4) segments. There was only one individual (possibly a soldier) catalogued as a retainer for a high status burial (Figure 5.45). From the objects found in the graves, many of the individuals could be associated to one or more specific activities such as ceramic manufacture, warfare, weaving, and music. The majority of the fractures were found in the “low status” and “middle status” groups (7 cases out of 18 in both). However, proportionally the “high status” segment was the most affected by trauma, with

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[89] Sex was estimated based on the female traits of the pubis and the presence of preauricular sulcus.

75% (n = 3/4) of the individuals showing at least one fracture. Nevertheless, the small size of this subsample could be affecting the results. When only adults were compared, there was no difference in the prevalence of the different types of trauma between social status groups. The exception was accidental trauma, which at first glance seemed to be more frequent in the middle status group and in the retainer (100% – n = 4/4 and n = 1/1 vs. 60% – n = 3/5 and 0% – n = 0/1 in the low and high status groups respectively). Again, the small size of these subsamples seems to be affecting the results (Figure 5.46).

In sum, more than one half of the adolescents and adults (and all the male individuals) presented at least one fracture. In adults, the most common types of trauma were unknown (rib) and accidental fractures (especially in foot bones in males and vertebrae in females).

Prevalence of malintent trauma was higher in males (62.5%, n = 5/8) than in females (25%, n = 2/8) but a significant statistical difference could not be found (odds ratio = 5 – 95% CI 0.58-42.8). However, there was also a difference in the location of these lesions. In males, fractures were concentrated in the facial/anterior area of the skull, while in females, fractures were located in the posterior part of the vault. There was only one case of malintent trauma in subadults (6.7%, n = 1/15). Traumatic events were more lethal than in the previous periods. The majority of them were of moderate lethality (II), with two cases of fatal wounds produced by extreme violence (V). The MNEv was predominantly 1, with some cases of repetitive trauma. There was no apparent association between social status and the prevalence of trauma.

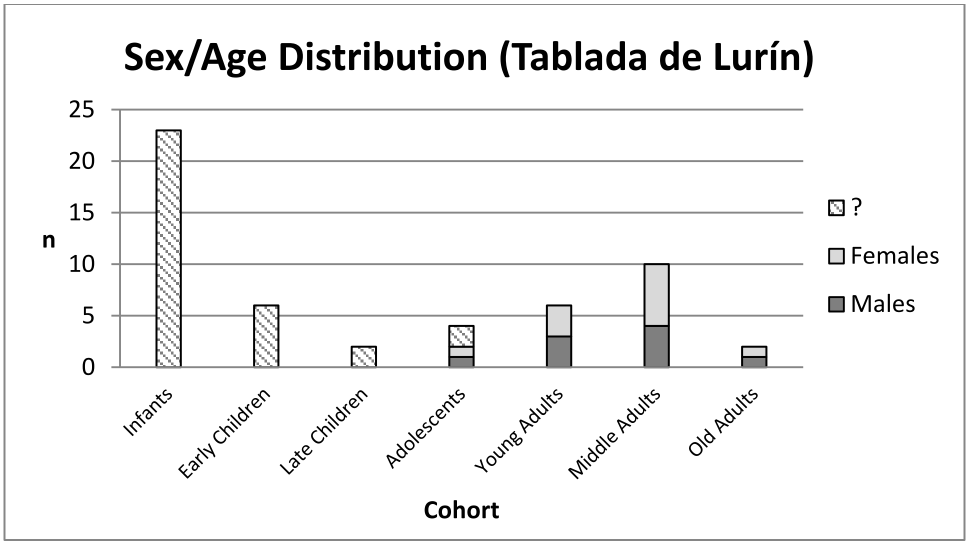

Figure 5.24: Sex and Age Distribution at the Site of Tablada de Lurín

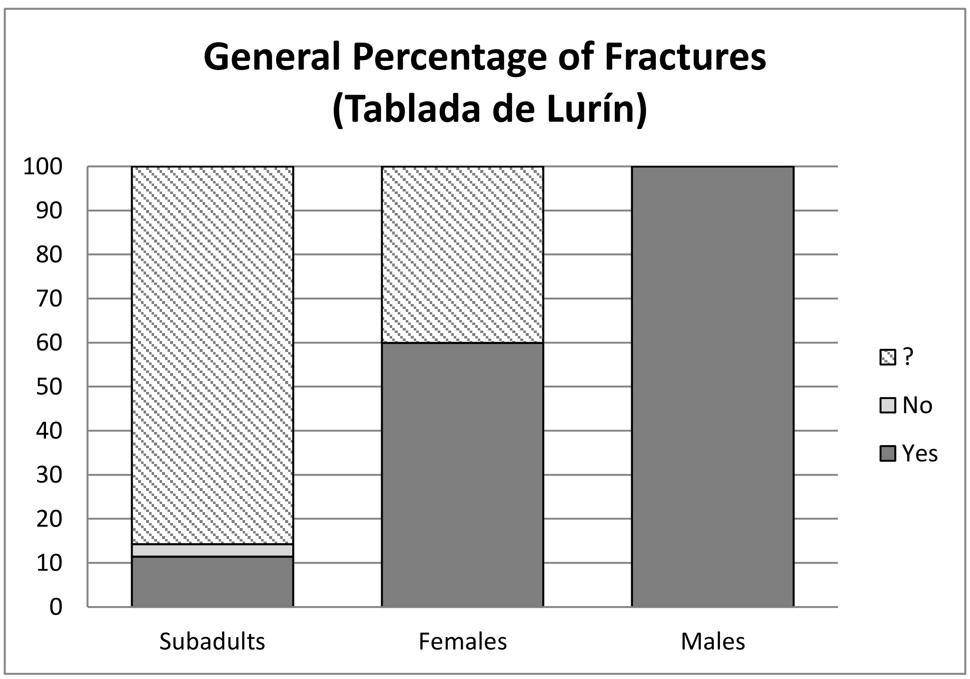

Figure 5.25: General Percentage of Fractures in Subadults, Females, and Males from Tablada de Lurín

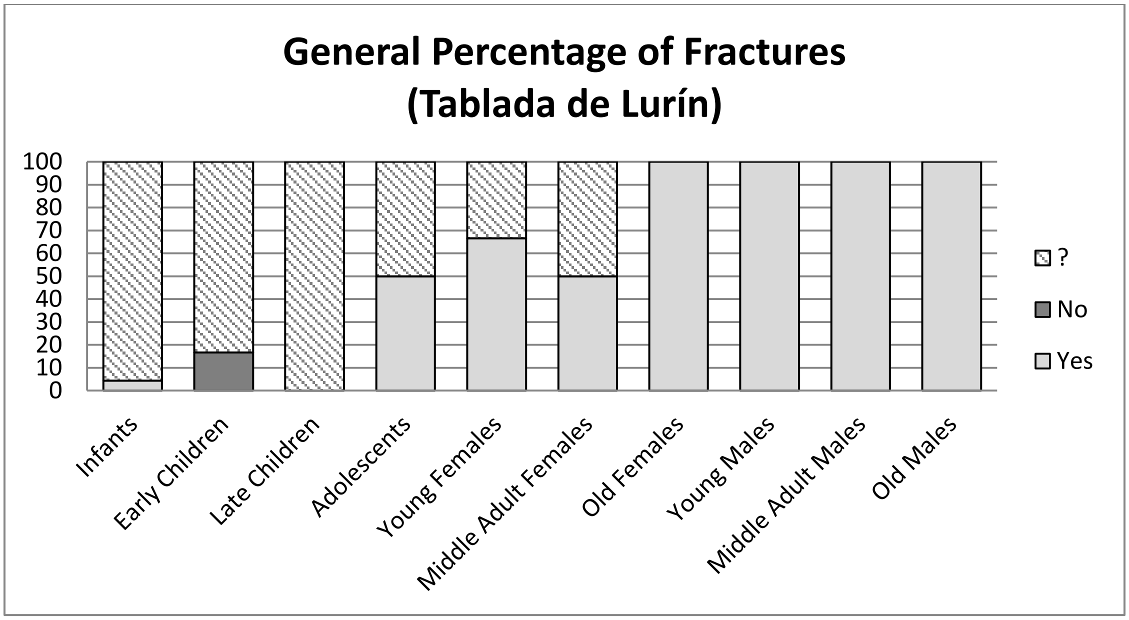

Figure 5.26: General Percentage of Fractures by Age Cohort at the Site of Tablada de Lurín

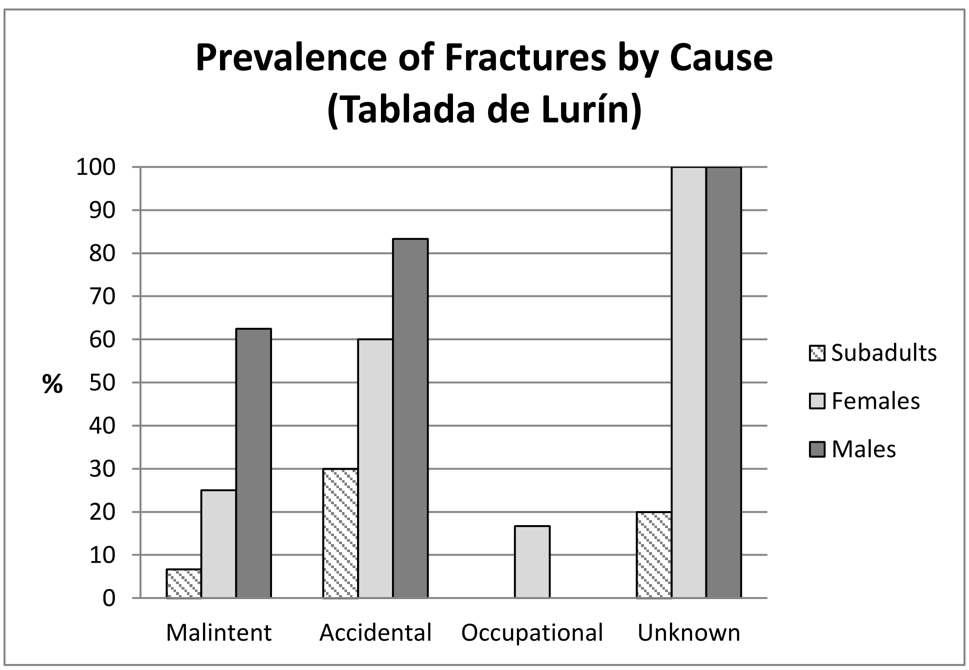

Figure 5.27: Prevalence in of Fractures by Most Probable Cause at the Site of Tablada de Lurín

Figure 5.28: Open Fracture with Reactive Bone Formation on a Right Rib (Tablada de Lurín, CF 259-IV, Old Female). Photo by Lisseth Rojas

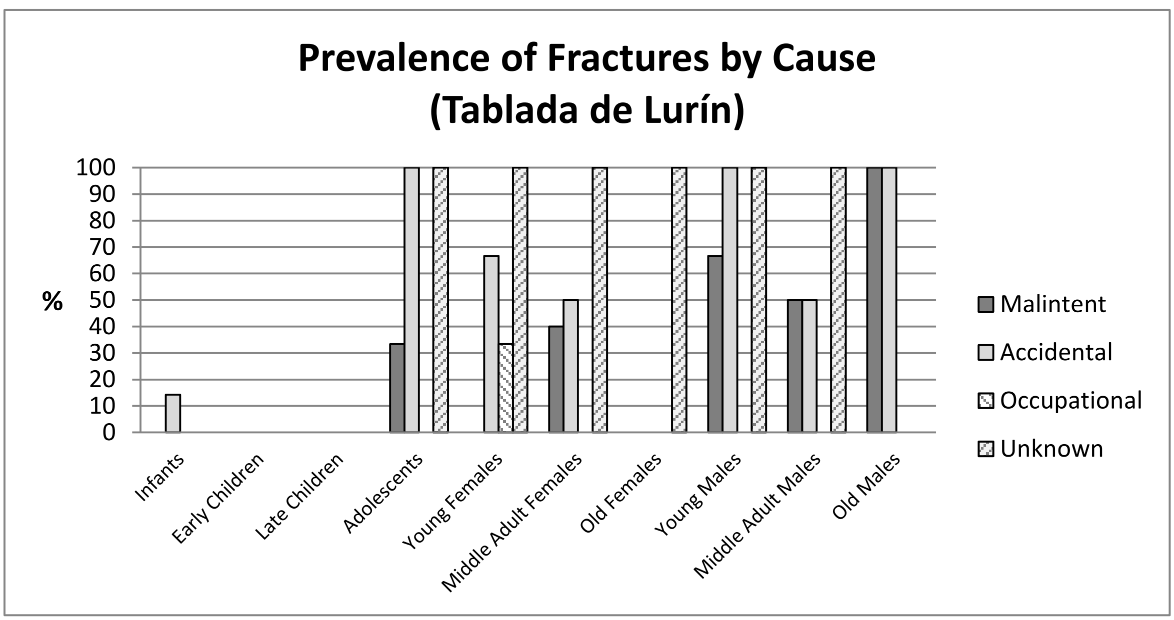

Figure 5.29: Most Probable Cause of Fractures by Age Cohort at the Site of Tablada de Lurín

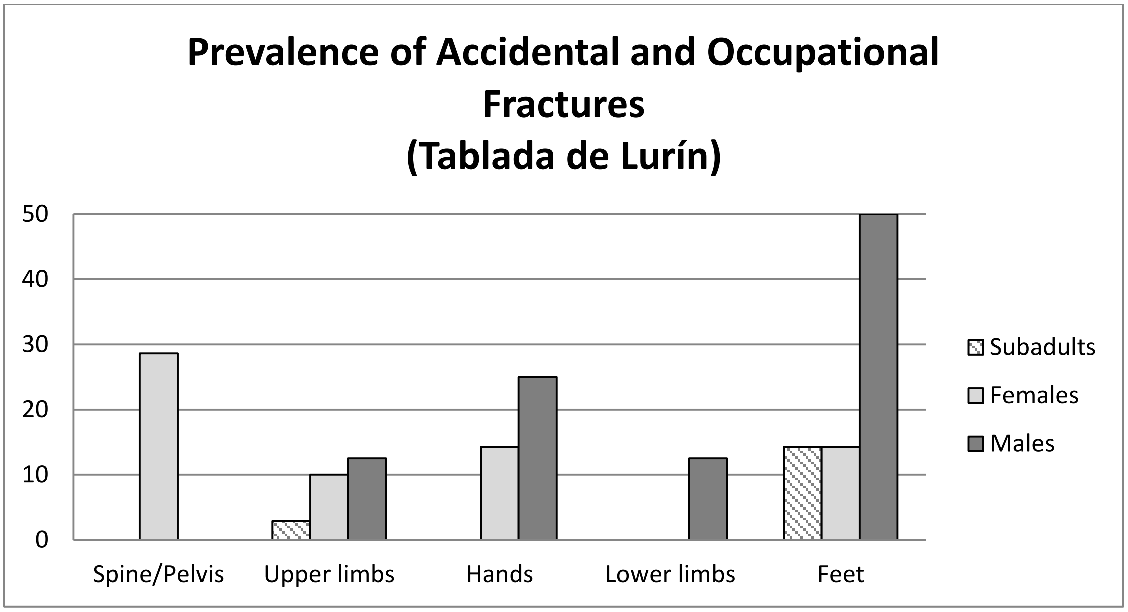

Figure 5.30: Prevalence of Accidental and Occupational Fractures by Location at the Site of Tablada de Lurín

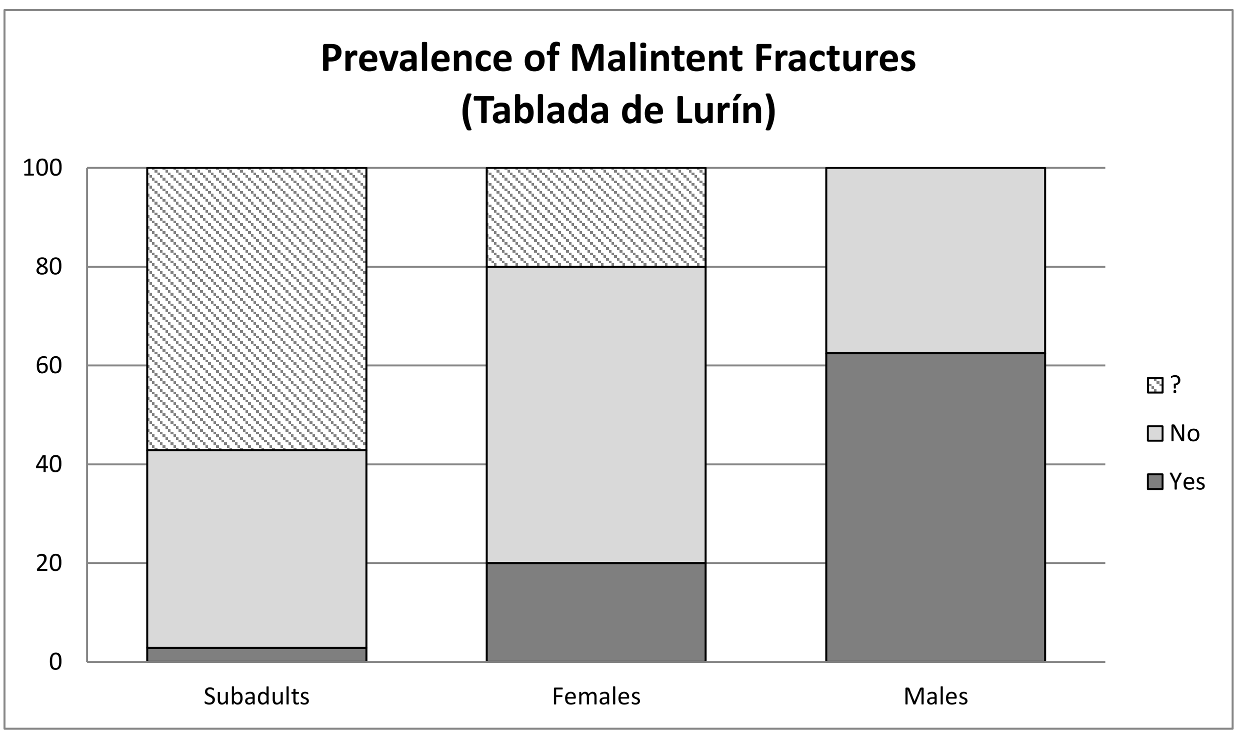

Figure 5.31: Percentage of Malintent Fractures at the Site of Tablada de Lurín

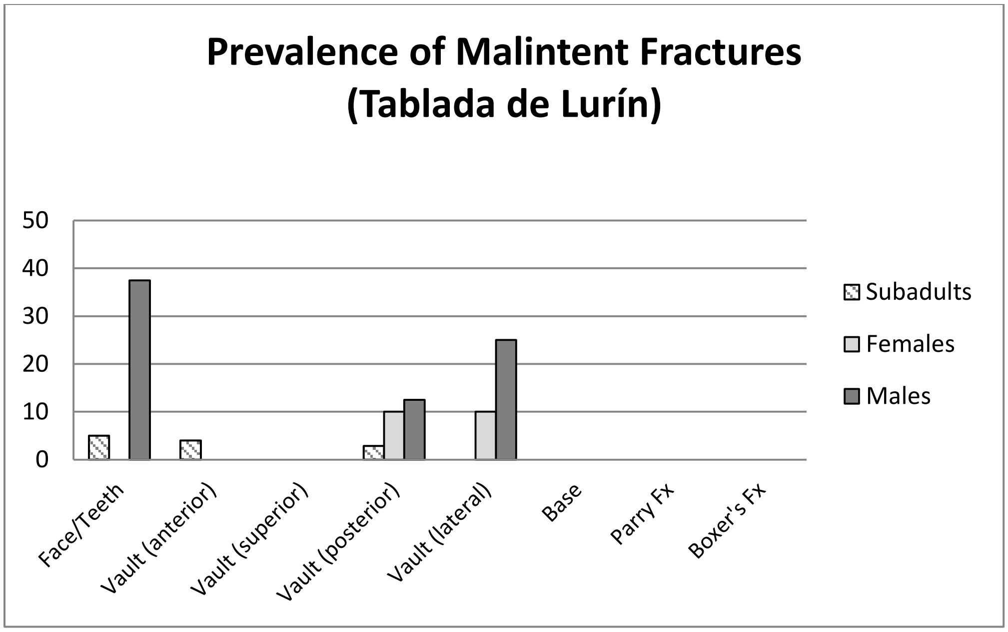

Figure 5.32: Prevalence of Malintent Fractures by Location/Type at the Site of Tablada de Lurín

Figure 5.33: Antemortem Fracture of the Nasal Bones (Tablada de Lurín, CF 302-I, Young Female). Photo by Vanessa Salomón

Figure 5.34: Three Perimortem Fractures (BFT) to the Right Parietal (Tablada de Lurín, CF 298, Old Male). Photo by Lisseth Rojas

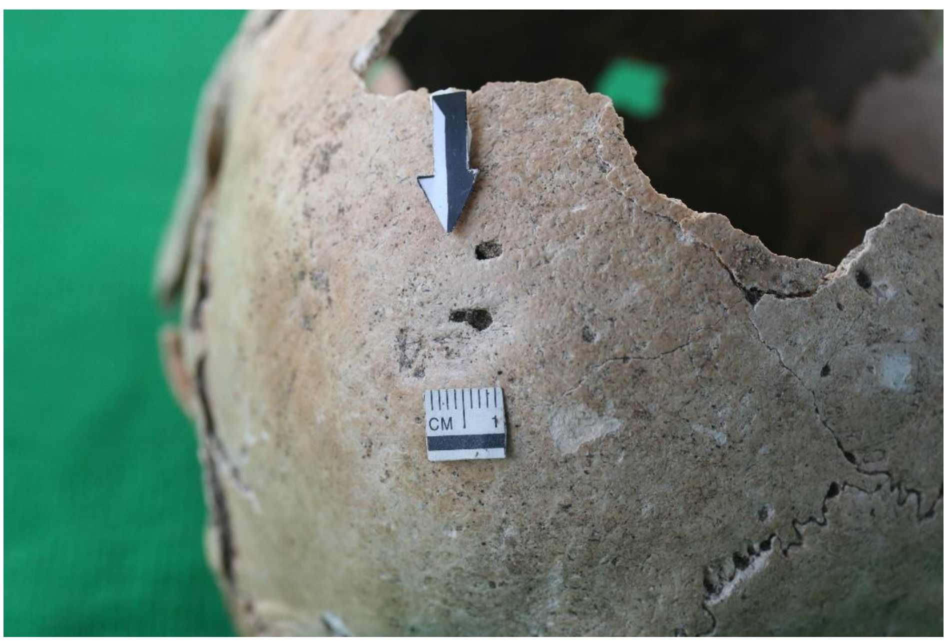

Figure 5.35: Antemortem Fracture on the Left Parietal (Tablada de Lurín, CF 282, Middle Adult Female). Photo by Lisseth Rojas

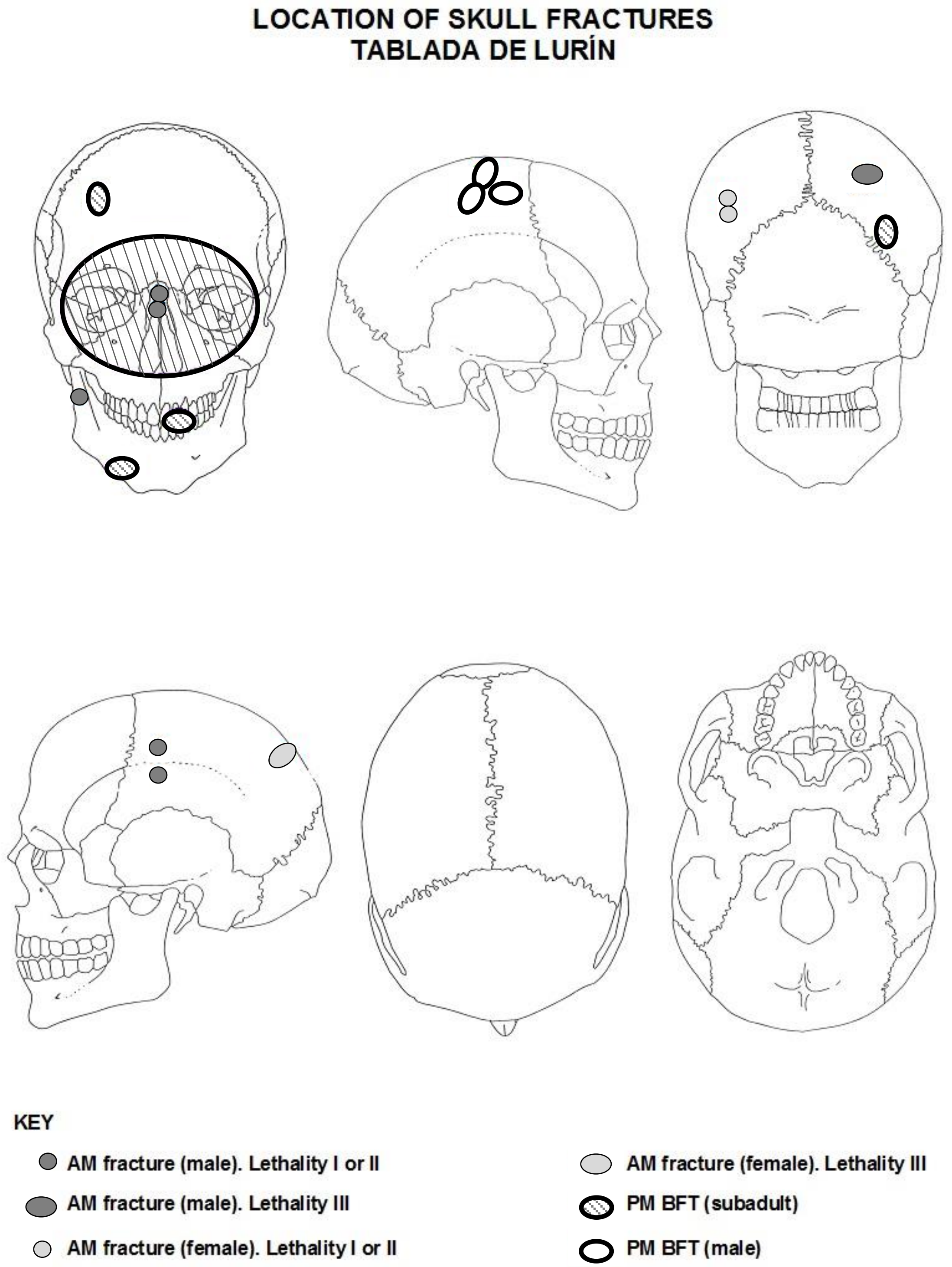

Figure 5.36: Location of Skull Fractures at the Site of Tablada de Lurín Based on Eight Individuals. Skull Sketches after Buikstra and Ubelaker (1994)

Figure 5.37: Perimortem Fracture (BFT) to the Frontal and Facial Bones (Tablada de Lurín, CF 70, Female Adolescent)

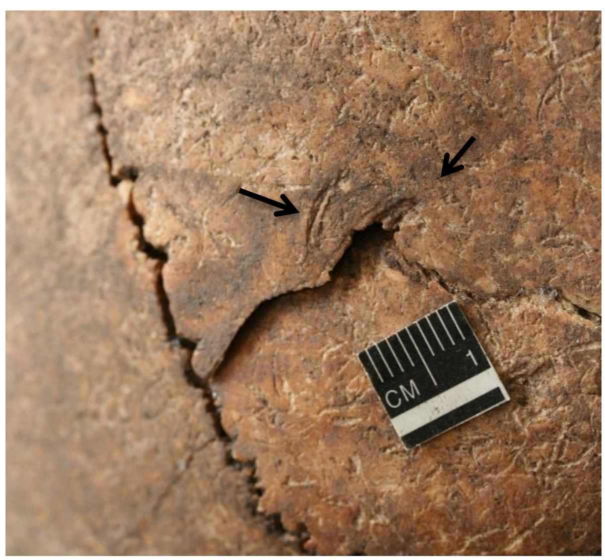

Figure 5.38: Close-up View of Perimortem Fracture (BFT) to the Right Frontal. Note the Marks Left by the Weapon (Tablada de Lurín, CF 70, Female Adolescent)

Figure 5.39: Perimortem Butterfly Fracture (BFT) on the Right Side of the Mandible (Tablada de Lurín, CF 70, Female Adolescent)

Figure 5.40: Perimortem Fracture (BFT) to the Right Parietal (Tablada de Lurín, CF 70, Female Adolescent)

Figure 5.41: Perimortem Mutilation of the Forearms
(Tablada de Lurín, CF 70, Female Adolescent)

Figure 5.42: Microscopic View of a Chop Mark on the Left Radius
(Tablada de Lurín, CF 70, Female Adolescent)

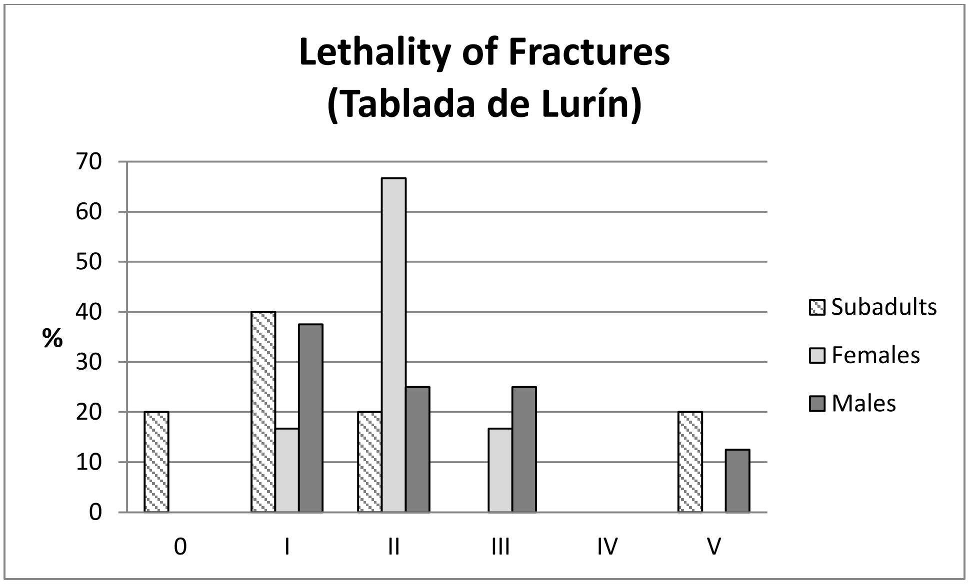

Figure 5.43: Prevalence of Fractures by Lethality at the Site of Tablada de Lurín

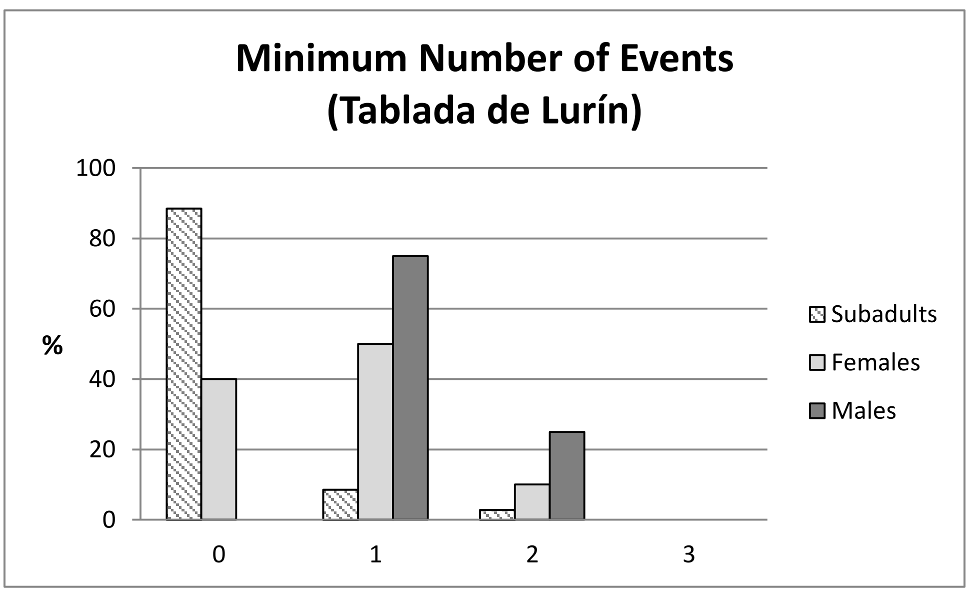

Figure 5.44: Minimum Number of Events at the Site of Tablada de Lurín

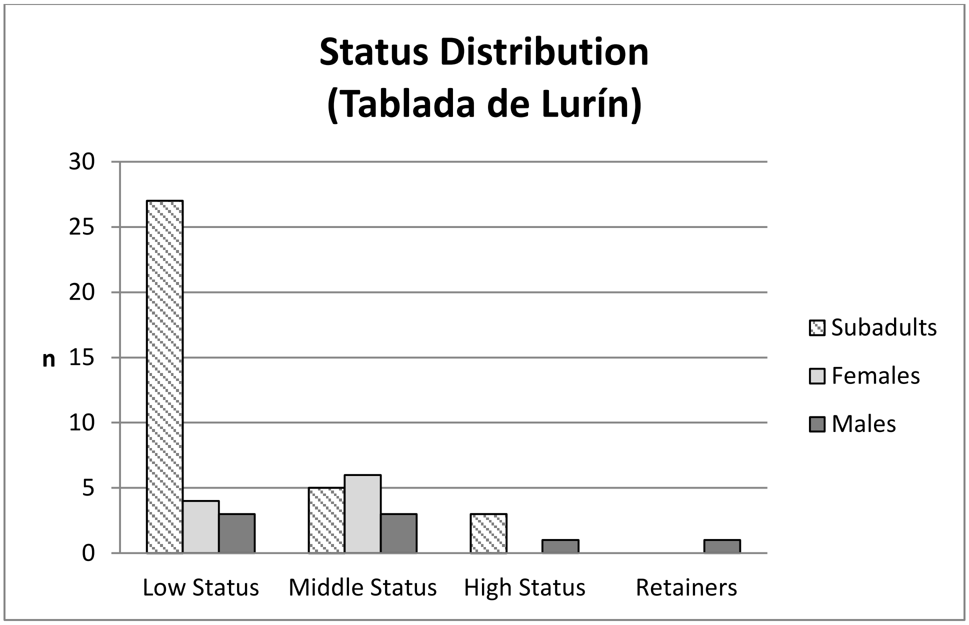

Figure 5.45: Status Distribution at the Site of Tablada de Lurín

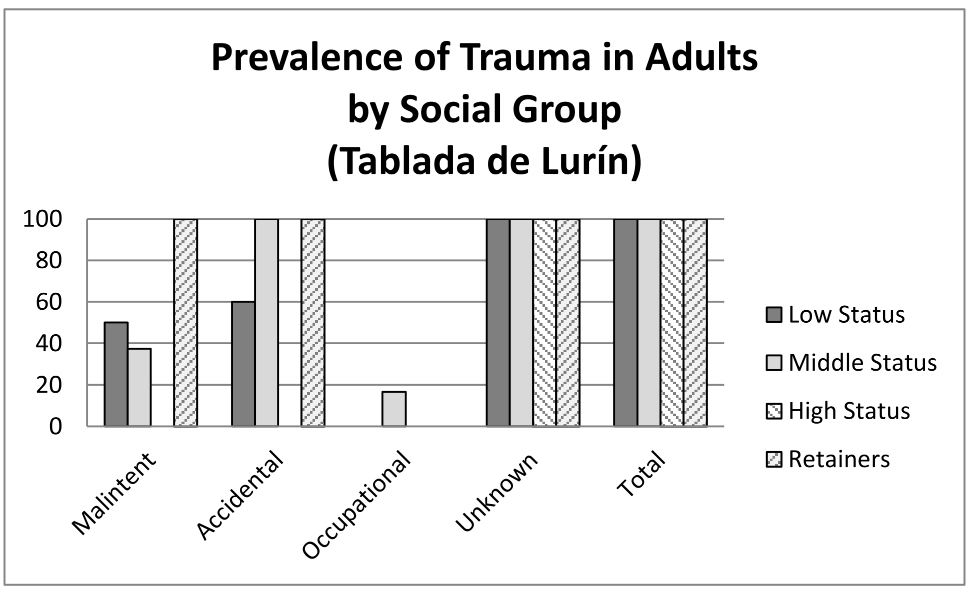

Figure 5.46: Prevalence of Trauma in Adults by Social Status at the Site of Tablada de Lurín

5.3 Early Intermediate Period B (Middle Lima)

The Middle Lima Period was represented by one sample, Cerro Culebra (n = 45), excavated between 1992 and 1993 by Falcón. All the skeletons were analyzed by the author.

The sample presented a high proportion of infants (24.4%, n = 11) and early children (35.6%, n = 16) that were consistent with the demographic expectations for this kind of societies (see Chamberlain 2006; Séguy et al. 2008; Wood et al. 2002). However, it presented an abnormal sex proportion among adults (10 females vs. 4 males) (Figure 5.47).

More than half of the adults presented some kind of trauma (80% – n = 8/10 in females and 50% – n = 2/4 in males, especially among middle adults), contrary to subadults (3.2%, n = 1/31), who only presented one case of skull fracture in an infant (Figures 5.48 and 5.49). Nevertheless, it must be noted that in many cases hand and foot bones were incomplete. When only very complete skeletons were considered, the prevalence was 100% for males (n = 2/2) and subadults (n = 1/1), and 88.9% (n = 8/9) for females. Accidental fractures were the most common kind of trauma in adults (62.5% – n = 5/8 in females and 100% in males, albeit there was only one complete male skeleton available), followed by malintent trauma. Rib fractures were only present in females (33.3% – n = 3/9, odds ratio = 4.85 – 95% CI 0.2-118.62 as compared to the male prevalence of 0% – n = 0/4) (Figures 5.50 to 5.52). There was no relation between location for accidental and occupational traumas (Figure 5.53).

The prevalence of malintent trauma was the same in males and females (50% – n = 2/4 and n = 5/10 respectively, especially high in the oldest age cohorts), but is was much lower in subadults (4.8%, n = 1/21). Nonetheless, the poor preservation of the vault and ulnae in almost one third of the subadult subsample could be affecting the result (Figure 5.54). It seems like there were no major differences in the location of the malintent fractures between males and females. While the males presented fractures on the face, and the anterior and posterior parts of the vault; the females had lesions of the face, the superior-posterior part of the vault, and ulna. The single affected subadult individual had a fracture that was located on the superior-posterior part of the right parietal (Figures 5.55 to 5.61).

In this sample, there were no cases of fatal wounds. The majority of traumatic lesions in females were catalogued as I or II (low or moderate lethality), while wounds in males were slightly more lethal (II or III). The only case of skull fracture in subadults was described as highly lethal (III) (Figure 5.62). The MNEv was predominantly 0 among subadults, and 1 among females. Males had a MNEv of 0 to 1 (Figure 5.63).

Eighty percent of the individuals were catalogued as "low status" (n = 36), 2.2% as "middle status" (n = 1) and the remaining 17.8% (n = 8) were classified as "unknown status" (Figure 5.64). This distribution did not allow the identification of possible differences in the prevalence of trauma by social status. However, comparing the prevalence of trauma of the low status adults of this and the samples from the prior time period, it should be noted that there were no differences in the prevalence of trauma (Figures 5.46 and 5.65). The exception was rib fractures (100%, n = 2/2 in Tablada de Lurín and 25%, n = 3/12 in Cerro Culebra), but the difference between status groups was not statistically significant due to the small sample size of Tablada de Lurín (odds ratio = 13.57 – 95% CI 0.51-358.66).

Summing up, almost every adult in Cerro Culebra presented at least one traumatic injury, especially of the accidental kind. Malintent trauma was present in 50% of the males (n = 2/4) and females (n = 5/10), and 4.8% (n = 1/21) of the subadults. There were no sex differences in the location, lethality, or MNEv of the lesions, which were located both in the face and vault, with no cases of repetitive trauma or fatal wounds. However, the poor preservation of the remains and the small number of individuals could be hiding the real prevalence of malintent trauma in this population, especially among males and subadults. This pattern contrasts to what was found in the prior time period, in which malintent trauma affected the sexes in different ways (males more affected than females and in different areas of the skeleton) and tended to be more violent.

No strong social differentiation was found in Cerro Culebra, which was mostly composed of low status individuals. This social group presented similar prevalences of trauma as did the low status individuals of the previous time period.

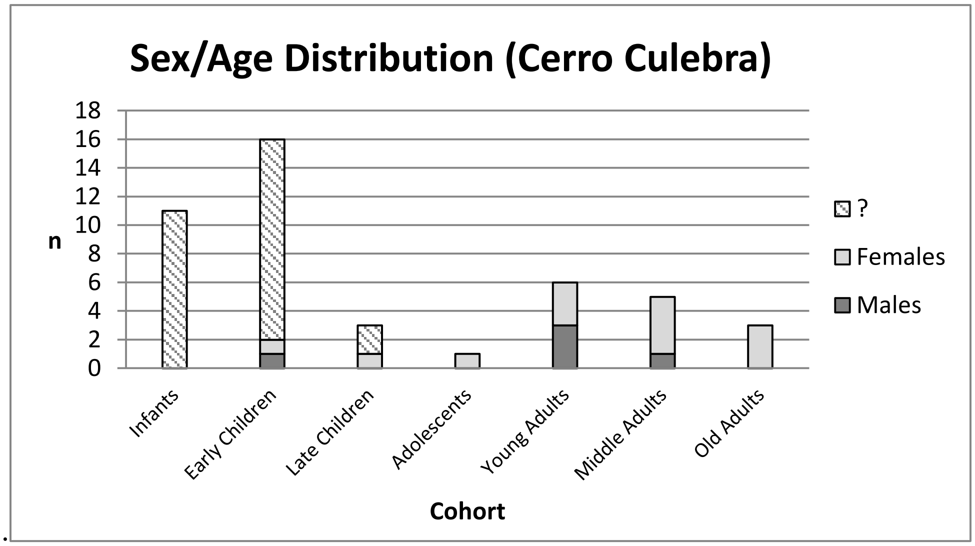

Figure 5.47: Sex and Age Distribution at the Site of Cerro Culebra

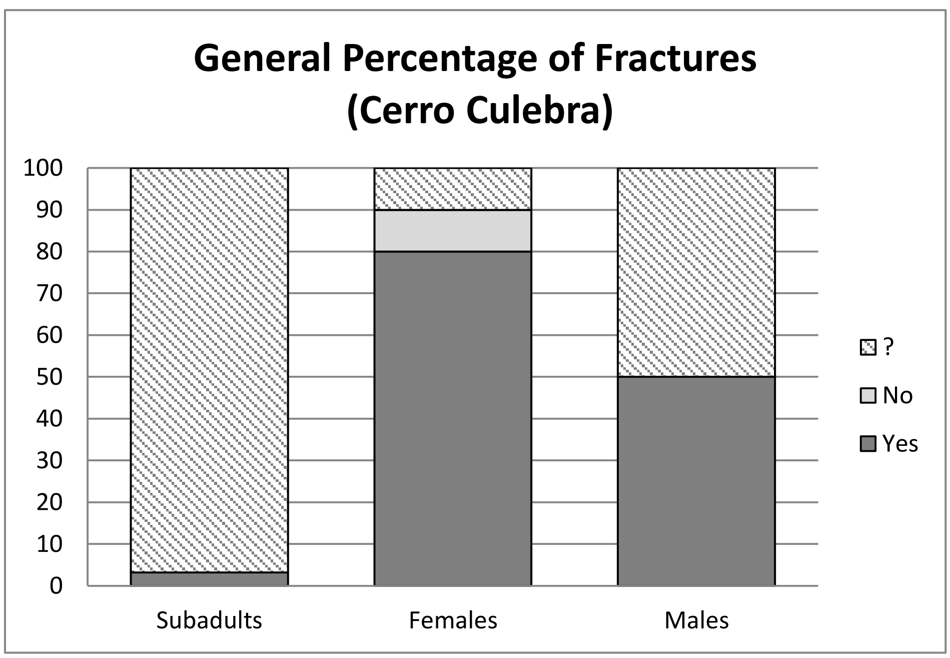

Figure 5.48: General Percentage of Fractures in Subadults, Females, and Males from Cerro Culebra

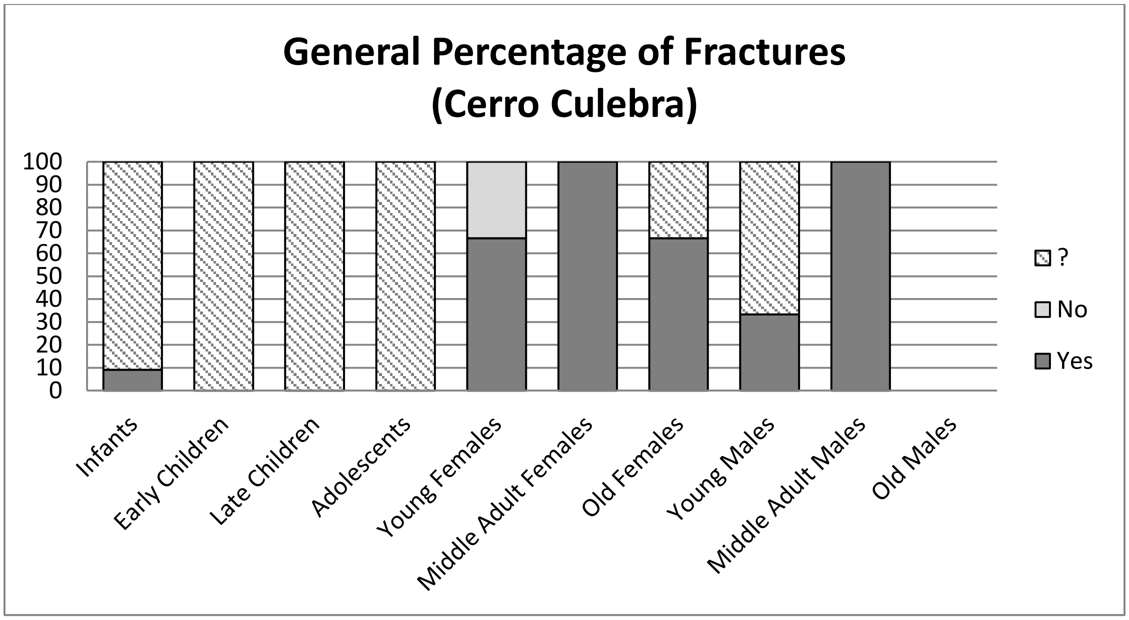

Figure 5.49: General Percentage of Fractures by Age Cohort at the Site of Cerro Culebra

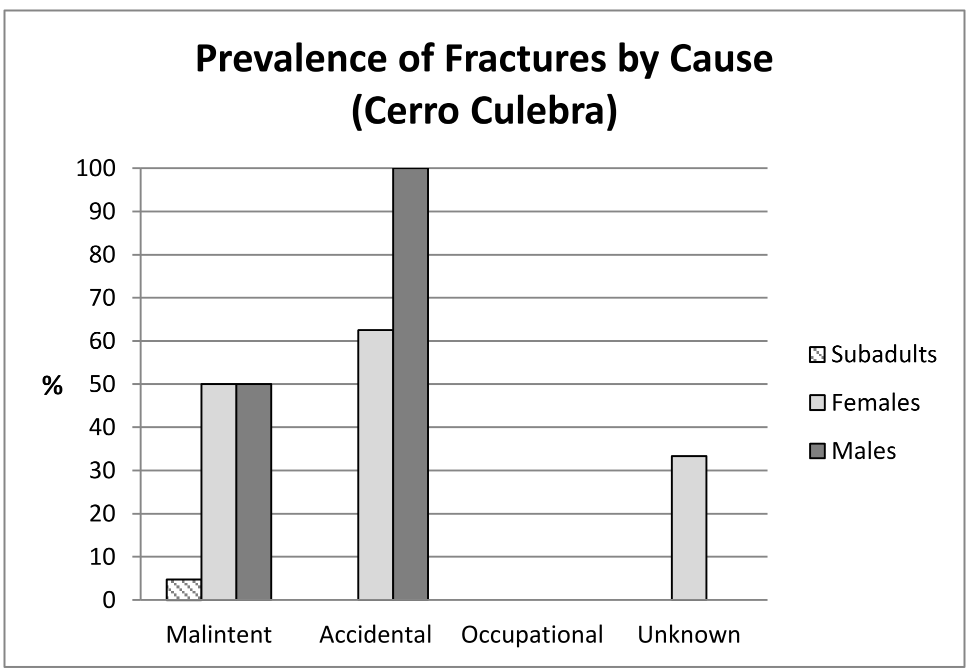

Figure 5.50: Prevalence of Fractures by Most Probable Cause at the Site of Cerro Culebra

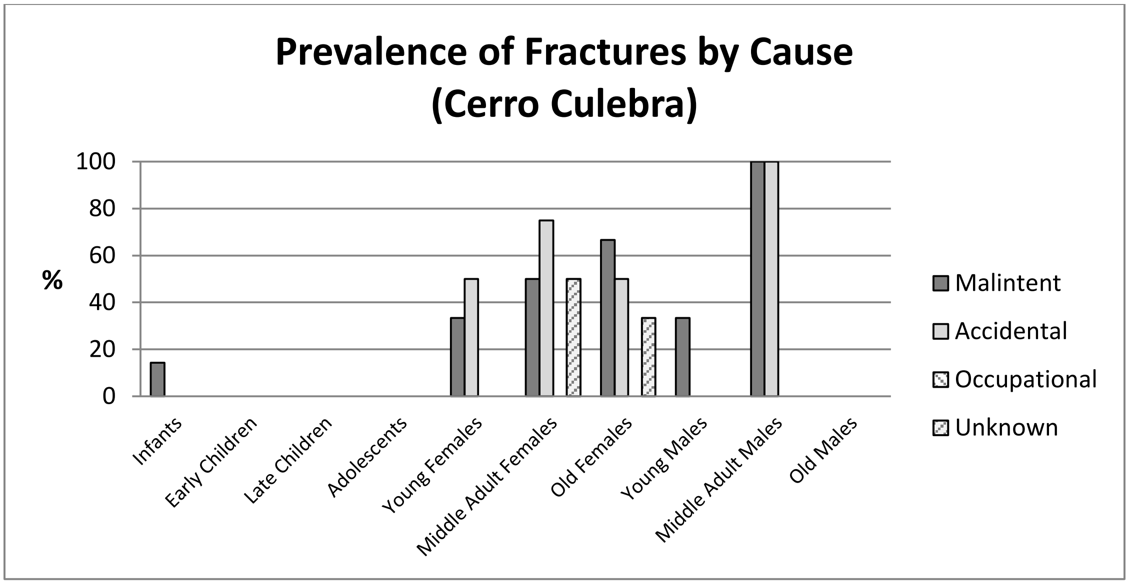

Figure 5.51: Most Probable Cause of Fractures by Age Cohort at the Site of Cerro Culebra

Figure 5.52: Colles' Fracture of the Right Radius (Cerro Culebra, QII-E37, Middle Adult Female)

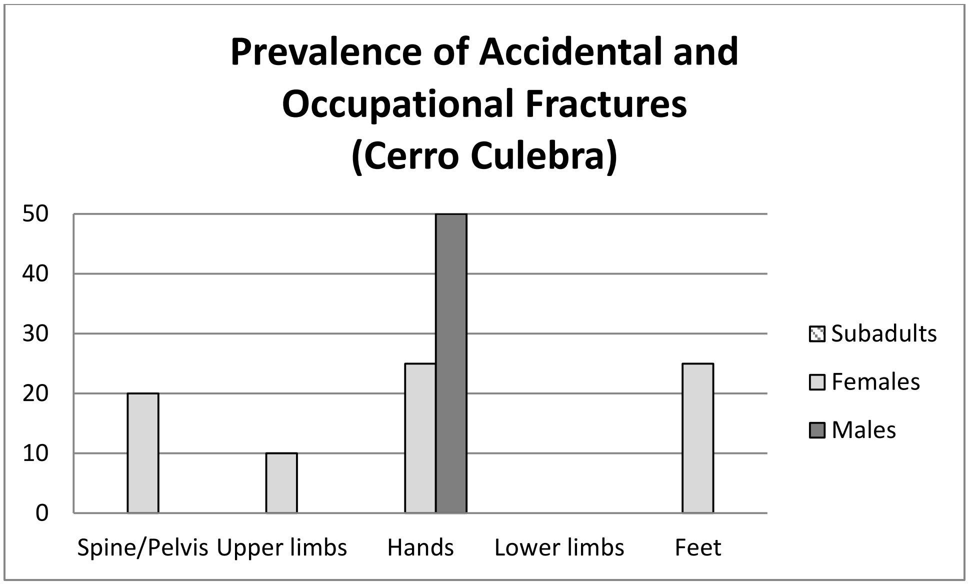

Figure 5.53: Prevalence of Accidental and Occupational Fractures by Location at the Site of Cerro Culebra

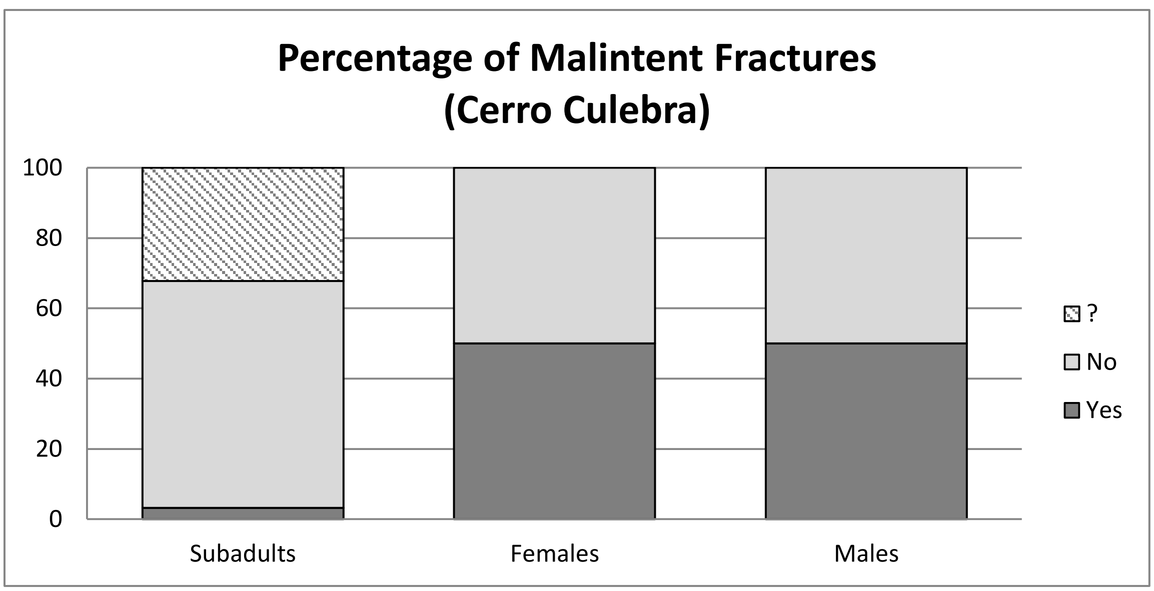

Figure 5.54: Percentage of Malintent Fractures at the Site of Cerro Culebra

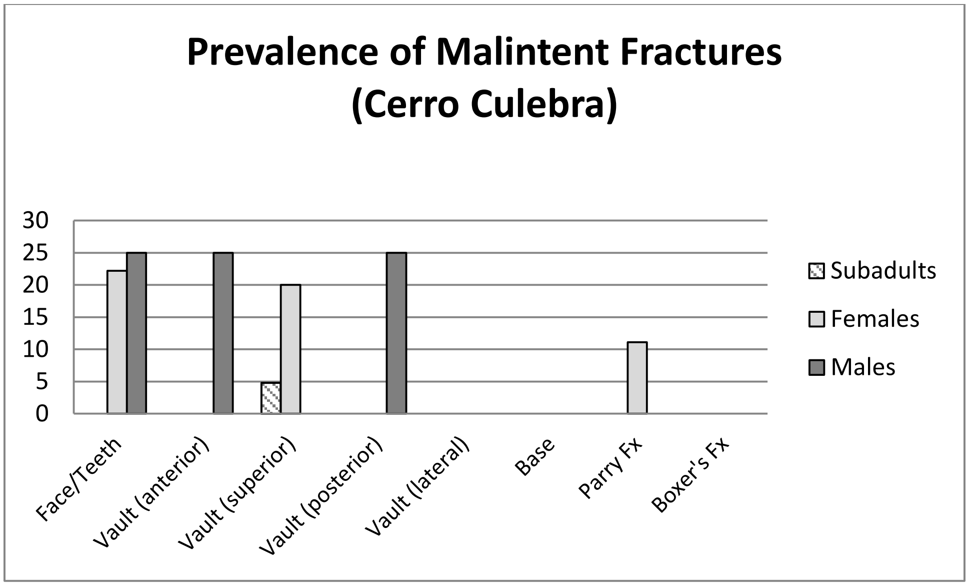

Figure 5.55: Prevalence of Malintent Fractures by Location/Type at the Site of Cerro Culebra

Figure 5.56: Antemortem Fracture on the Frontal Bone (Cerro Culebra, QII-E29, Middle Adult Male)

Figure 5.57: Open Mandibular Fracture with Reactive Bone Formation (Cerro Culebra, QIII-S/R, Young Female)

Figure 5.58: Parry Fracture of the Left Ulna (Cerro Culebra, QII-E11, Old Female)

Figure 5.59: Antemortem Fracture on the Left Parietal of a Modified Skull (Cerro Culebra, QII-E12, Infant). The Skull was Poorly Reassembled and Glued Before this Investigation.

Figure 5.60: Close-up View of Antemortem Fracture on the Left Parietal (Cerro Culebra, QII-E12, Infant)

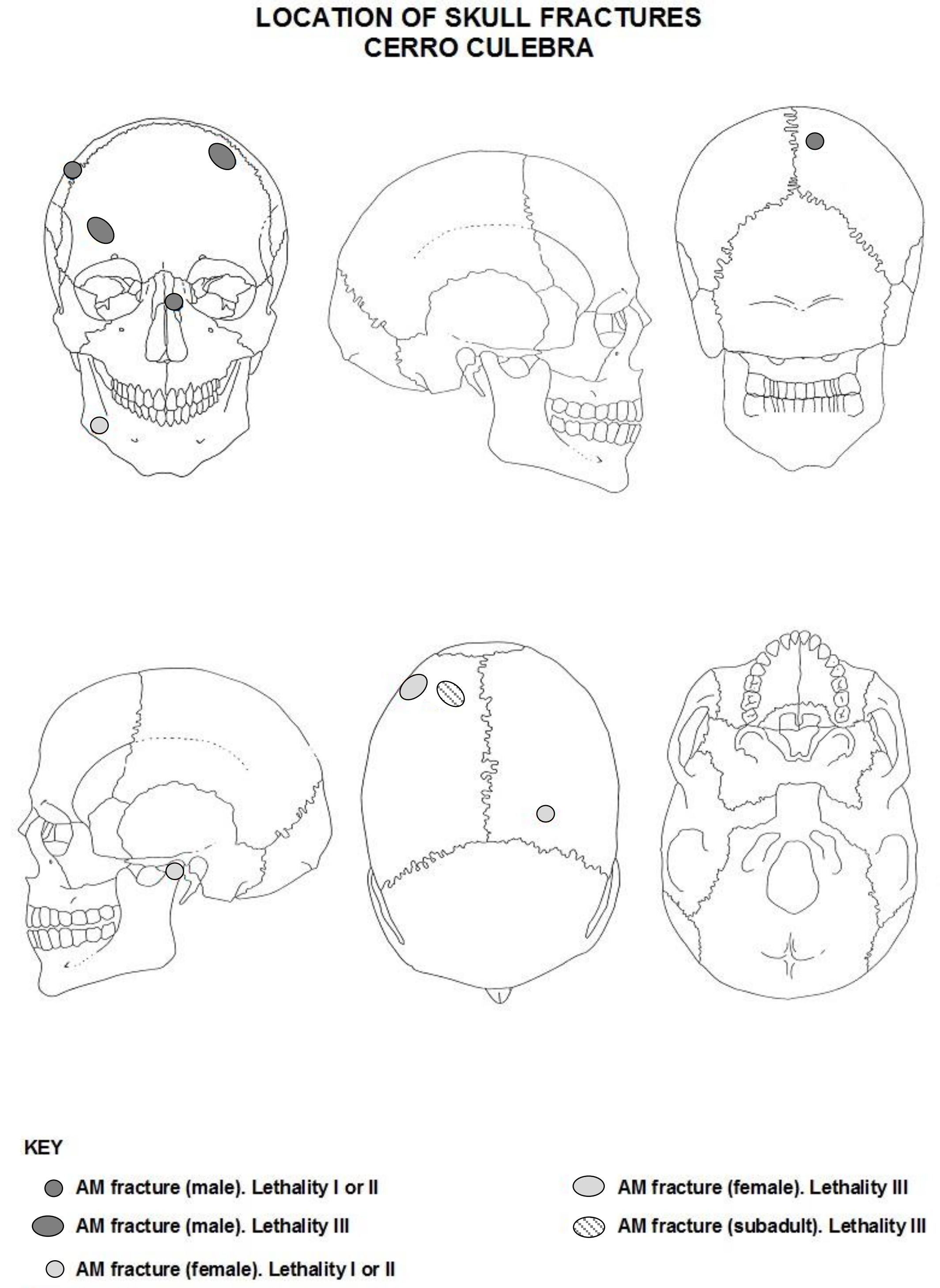

Figure 5.61: Location of Skull Fractures at the Site of Cerro Culebra Based on Seven Individuals. Skull Sketches after Buikstra and Ubelaker (1994)

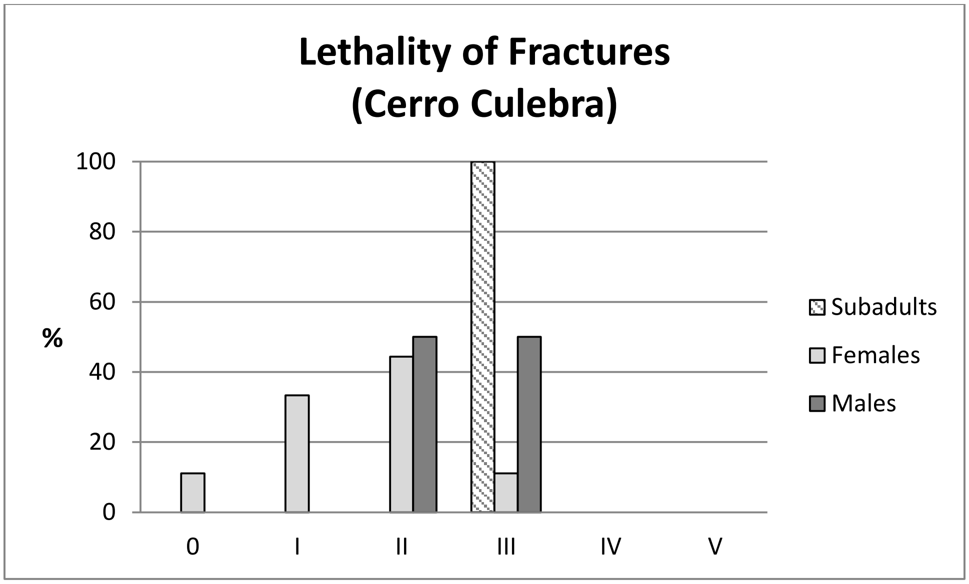

Figure 5.62: Prevalence of Fractures by Lethality at the Site of Cerro Culebra

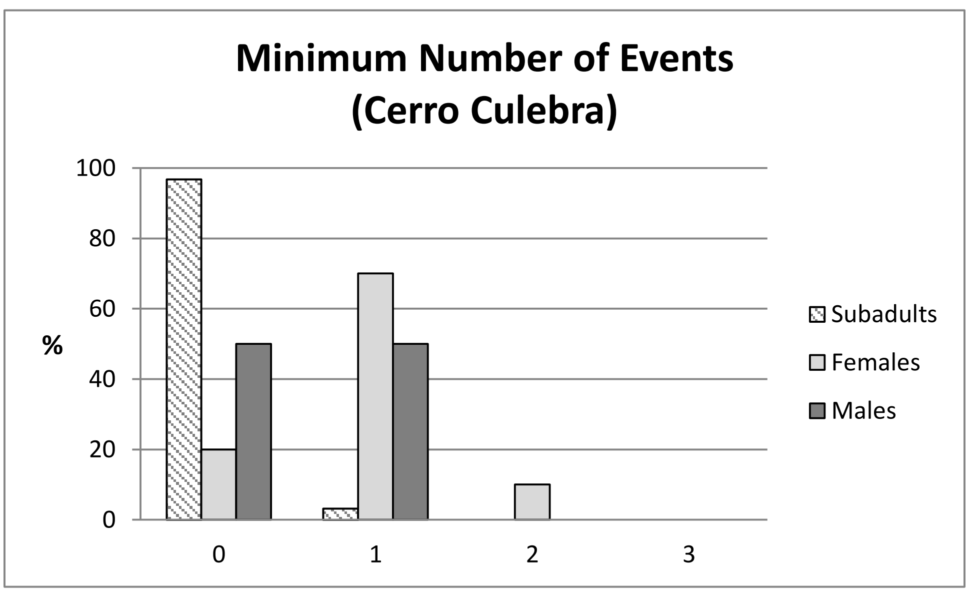

Figure 5.63: Minimum Number of Events at the Site of Cerro Culebra

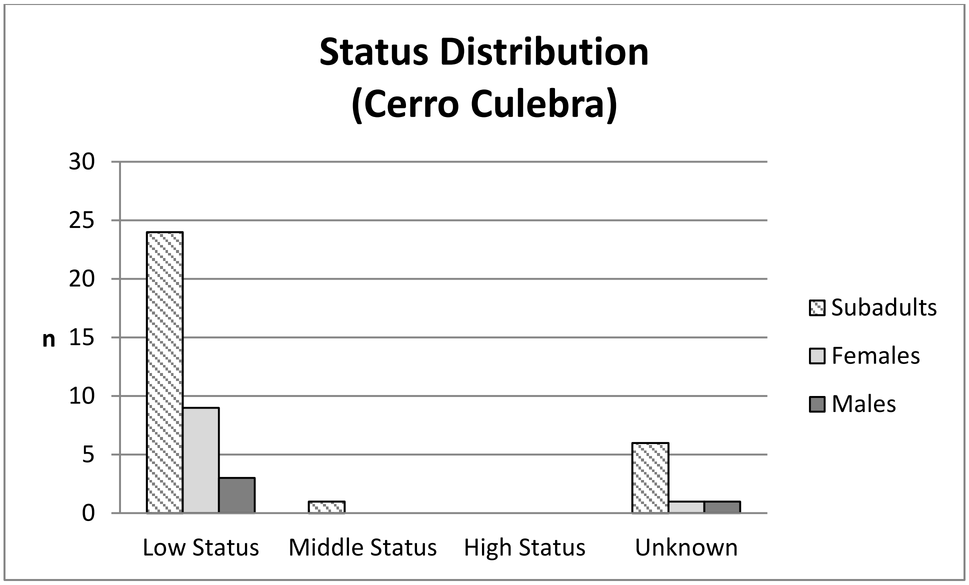

Figure 5.64: Status Distribution at the Site of Cerro Culebra

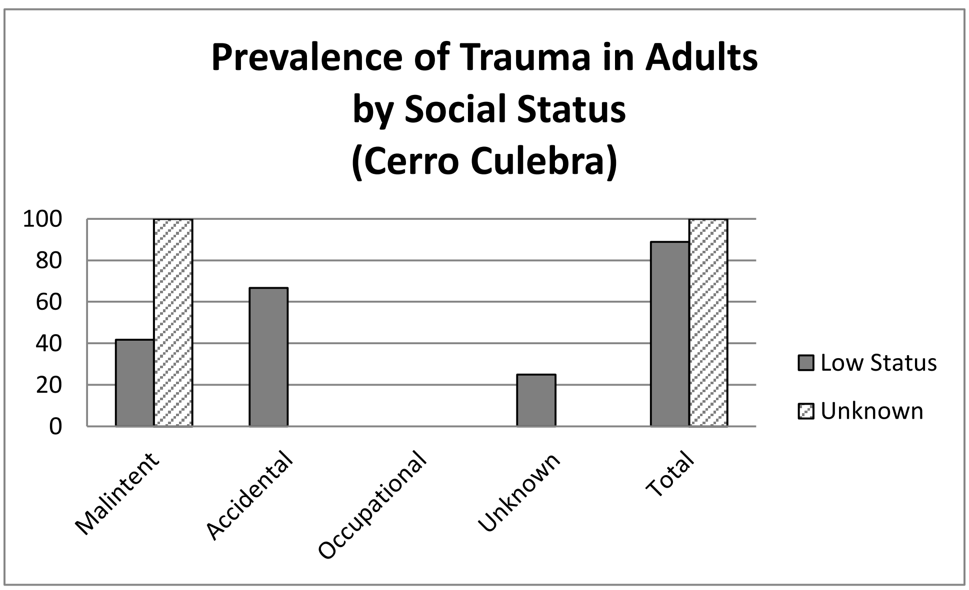

Figure 5.65: Prevalence of Trauma in Adults by Social Status at the Site of Cerro Culebra

5.4 Middle Horizon 1 Period (Late Lima)

Two samples were analyzed that dated to the Middle Horizon 1 (Late Lima) Period. The largest sample (n = 229), was recovered in Huaca 20 (of the Maranga complex) by four different projects, directed by Cárdenas (1999), Rengifo (2005-2006), Prieto (2006-2007), and Mauricio (2007-2008). The other sample, Copacabana (n = 27), was excavated by Falcón (2012-2013). Both samples were studied by the author, and the results are presented separately, as the size of both samples (especially in Huaca 20), makes it possible to explore inter-site differences.

The biological profiles of these two samples were, at first glance, different. While Huaca 20 presented what we can call a standard paleodemographic distribution (see Chamberlain 2006; Séguy et al. 2008; and Wood et al. 2002), with a great concentration of individuals in the two youngest age cohorts (18.3%, n = 42 of infants and 17.9%, n = 41 of early children) and the highest adult mortality between 19-35 years (young adults, n = 86) (Figure 5.66), Copacabana presented its highest peak in the young adults group (44.4%, n = 12/27) (Figure 5.67). However, the true difference between the two samples was the lack of infants in Copacabana, which could be explained (at least partially) by the different excavation strategies employed to recover the skeletons. While Huaca 20 was extensively excavated, the work in Copacabana was limited to few and small excavation units.

In Huaca 20, the general percentage of trauma in adult females was lower than in the previous period (30.3%, n = 20/66). This reduction was also found in males (40.9%, n = 27/66). In both cases, middle adults were the most affected. Subadults showed similar results (3.1%, n = 3/97) to the Middle Lima Period (Figures 5.68 and 5.69). However, this apparent reduction in the adult rates could be related to the poor preservation of the remains. When only observable cases were used, the prevalence was 95-100% in the three groups. On the other hand, Copacabana was unique with a high percentage of trauma in males (88.9%, n = 8/9), twice that of females (44.4%, n = 4/9). Every middle and old adult exhibited at least one fracture, and there was just one case of trauma in a subadult (11.1%, n = 1/9) (Figures 5.70 and 5.71). The prevalence of trauma was 100% in adults (n = 12/12) and subadults (n = 1/1) when only observable cases were employed.

Accidental and unknown fractures were the most common kinds of trauma in the adults from Huaca 20. Males presented a greater prevalence of unknown fractures (71.4%, n = 5/7 vs. 50%, n = 2/4) but females duplicated the male prevalence of occupational fractures – spondylolysis in L4 or L5 (13.8%, n = 4/29 vs. 6.9%, n = 2/29). When the sample was separated into age cohorts these differences still existed (with higher prevalence in the middle adults), but a stronger difference appeared between middle adult male (100%, n = 4/4) and middle adult female (50%, n = 1/2) rib fractures (Figures 5.72 to 5.75). Although none of these differences was statistically significant, the odds ratio for occupational fractures (when males and females were compared) was: 2.16 (95% CI 0.36-12.84). In Copacabana, accidental fractures were the most common type of trauma in adults (100%, n = 9/9). However, malintent (n = 3/4) and unknown (n = 7/9) traumatic lesions were also high in males (~75%), which contrasted with the results from females, who had a prevalence of 33.3% for malintent trauma (n = 1/3) and 0% for unknown trauma (n = 0/7). Unknown trauma was also present in one subadult (14.3%, n = 1/7). Statistical significance was found between males and females in the prevalence of unknown trauma (<u>odds ratio = 45 – 95% CI 1.83-1104.7</u>)[90] (Figures 5.76 to 5.78). The most common location for accidental and occupational traumas was foot bones in the two sites, and vertebrae in females of Huaca 20 (Figures 5.79 and 5.80). The difference was statistically significant between vertebral fractures in males (4.9%, n = 3/61) and females (18.5%, n = 10/54) from Huaca 20 (<u>odds ratio = 4.39 – 95% CI 1.14-16.92</u>)[91].

In Huaca 20, the prevalence of malintent trauma among males and females was similar (27.6%, n = 8/29 and 30%, n = 6/20), but it was much lower in subadults (4.5%, n = 1/22). However, males of Copacabana had more malintent trauma than females (75% – n = 3/4 vs. 33.3% – n = 1/3, odds ratio = 6 – 95% CI 0.22-162.54), with no subadult cases of this kind of trauma. Males of Copacabana showed more cases of malintent trauma than males of Huaca 20 (75% – n = 3/4 vs. 27.6% – n = 8/29, odds ratio = 7.88 – 95% CI 0.71-87.27). This represents a decrease from the prevalence of malintent trauma seen in the

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[90] Fisher's exact probability test: P=.003 (two-tailed)

[91] Fisher's exact probability test: P=.04 (two-tailed)

prior time period (50% in both sexes, odds ratio = 2.33 – 95% CI 0.49-11.17) compared to females of Huaca 20; odds ratio = 2 – 95% CI 0.13-29.81 compared to females of Copacabana; and odds ratio = 2.63 – 95% CI 0.31-21.92 compared to males of Huaca 20), except by Copacabana males, where the opposite occurred (odds ratio = 3 – 95% CI 0.15-59.89). Nevertheless, the high number of fragmented skulls and ulnae in both sites could be affecting these results (Figures 5.81 and 5.82).

Males and females in Huaca 20 had a tendency to experience malintent traumatic lesions on the anterior/facial area of the skull, something that was also seen in the only subadult with one of these fractures (a female adolescent of 16-19 years). Nevertheless, males also had some lesions in the posterior area of the skull (Figures 5.83 to 5.86). The prevalence of fractures in the facial and posterior areas of the skull was higher in males than in females (9.7% – n = 3/31 vs. 3.6% – n = 1/28, odds ratio = 2.89 – 95% CI 0.28-29.56 in facial fractures; and 9.4% – n = 3/32 vs. 3.8% – n = 1/26, odds ratio = 2.59 – 95% CI 0.25-26.46 in fractures to the posterior part of the vault). On the other hand, males from Copacabana had more cases of malintent trauma in the anterior/facial zone than females (50% – n = 3/6 vs. 16.7% – n = 1/6, odds ratio = 5 – 95% CI 0.34-72.78), who only presented one lesion on the anterior and posterior areas of the skull (Figures 5.87 to 5.91).

In these two samples, fatal wounds were rare (one male and one female from Huaca 20 and one late child of Copacabana) (Figures 5.92 to 5.94). Traumatic lesions in females of both sites and males from Huaca 20 were mainly of low lethality, with occasional cases of moderate and high lethality observed. In contrast, the majority of males in Copacabana demonstrated highly lethal wounds (50% – n = 4/8 in males vs. 25% – n = 1/4 in females, odds ratio = 3 – 95% CI 0.21-42.63), as was also seen in the previous time period. The only case of skull fracture in subadults in this site was catalogued as moderate lethality (Figures 5.95 and 5.96). The difference was statistically significant between highly lethal lesions in males of Copacabana and Huaca 20 (50% – n = 4/8 vs. 7.1% – n = 2/28, odds ratio = 13 – 95% CI 1.76-95.8)[92]. The MNEv was predominantly 0 in both sites

[92] Fisher's exact probability test: P=.01 (two-tailed)

(possibly related to the poor preservation of the Huaca 20 skeletons), except for the males from Copacabana, where the majority of individuals demonstrated a MNEv of 1. Only one male from each site and one female from Copacabana had evidence that the lesions were produced during at least two different events (Figures 5.97 and 5.98).

The majority of individuals from both sites were catalogued as low status (85.6% – n = 196 in Huaca 20, 92.6% – n = 25 in Copacabana) (Figures 5.99 and 5.100). Many of the male individuals in Huaca 20 were identified as fishermen, while most of the females were likely involved in weaving activities. In this site, the prevalence of malintent trauma was higher in low status than in middle status adults (32.4% – n = 12/55 vs. 9.1% – n = 1/11, odds ratio = 4.78 – 95% CI 0.54-42.21). Unknown fractures were more common in middle status adults than in the low status group (100% – n = 1/1 vs. 60% – n = 6/10, odds ratio =2.08 – 95% CI 0.07-63.42). However, the small number of observable individuals makes this statement inconclusive (Figure 5.101). When the results of the lower status adults of both sites are compared, Copacabana presents more cases of malintent and accidental trauma than Huaca 20 (57.1% – n = 4/7 and 100% – n = 9/9 in Copacabana vs. 32.4% – n = 11/34 and 47.6% – n = 20/42 in Huaca 20; odds ratios = 2.79 – 95% CI 0.53-14.67 and <u>20.85 – 95% CI 1.14-381.34</u>[93], respectively). In other words, the prevalence of accidental trauma in low status adults from Copacabana was significantly higher than in their peers from Huaca 20. Conversely, occupational trauma was higher in Huaca 20 (11.1% – n = 5/45 vs. 0% – n = 0/10, odds ratio = 2.85 – 95% CI 0.15-55.79). Low status females of both sites showed similar prevalences of malintent trauma (33.3% – n = 5/15 in Huaca 20, n = 1/3 in Copacabana), while low status males of Copacabana exhibited a higher prevalence than low status males from Huaca 20 (75% – n = 3/4 vs. 31.6% – n = 6/19, odds ratio = 6.5 – 95% CI 0.55-76.18). The small number of high status individuals in both sites and of middle status individuals in Copacabana did not allow comparisons between these groups.

[93] Fisher's exact probability test: P=.01 (two-tailed)

In summary, Huaca 20 and Copacabana presented differences that could be explained by the different demographic distribution and size of the samples. The most common type of trauma at both sites was accidental fracture (~60-65% in Huaca 20 and 100% in Copacabana), something that was also seen in the prior time period. At both sites, foot fractures were the most common location of accidental trauma. Prevalence of unknown fractures was also high in males of both sites (~70-80%) and females of Huaca 20 (50%), as was malintent trauma in males of Copacabana (75%).

The prevalence of malintent trauma was similar in males of Huaca 20 and females of both sites (~25-35%), but was higher in Copacabana males (75%).These numbers were similar when only low status adults were compared. When compared to the malintent trauma prevalence of the prior time period, a decrease in the prevalence of malintent trauma was noticed, with the exception of males of Copacabana, in which the prevalence was higher. However, no significant statistical difference was found. The location of the lesions was similar in the two sites. The lesions were concentrated in the anterior aspect of the skull, but while males presented more fractures in the facial bones, females demonstrated more trauma in the superior half of the frontal bone. Nevertheless, it is possible that the poor to fair preservation of the Huaca 20 material, which affected especially the facial area, was hiding a higher prevalence of malintent trauma of the site, specifically in males.

The majority of the lesions were described as low lethality (I), with the exception of Copacabana males, who had more highly lethal wounds (III) (similar to males from the previous time period). The difference in the prevalence of highly lethal trauma between males from Huaca 20 and Copacabana was statistically significant. The MNEv was mostly 0, except for males of Copacabana, who presented predominately a MNEv of 1. Fatal wounds and cases of repetitive trauma were rare.

Most of the individuals from both sites were catalogued as “low status”. In Huaca 20, low status adults presented more malintent trauma than middle status adults (32.4%, n = 12/55 vs. 9.1%, n = 1 /11), although statistical significance was not found.

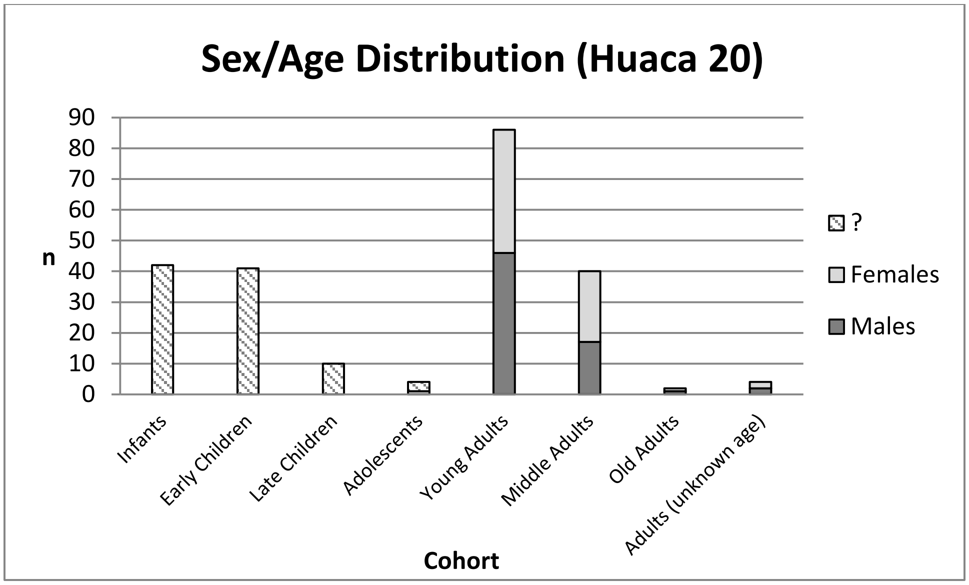

Figure 5.66 Sex and Age Distribution at the Site of Huaca 20

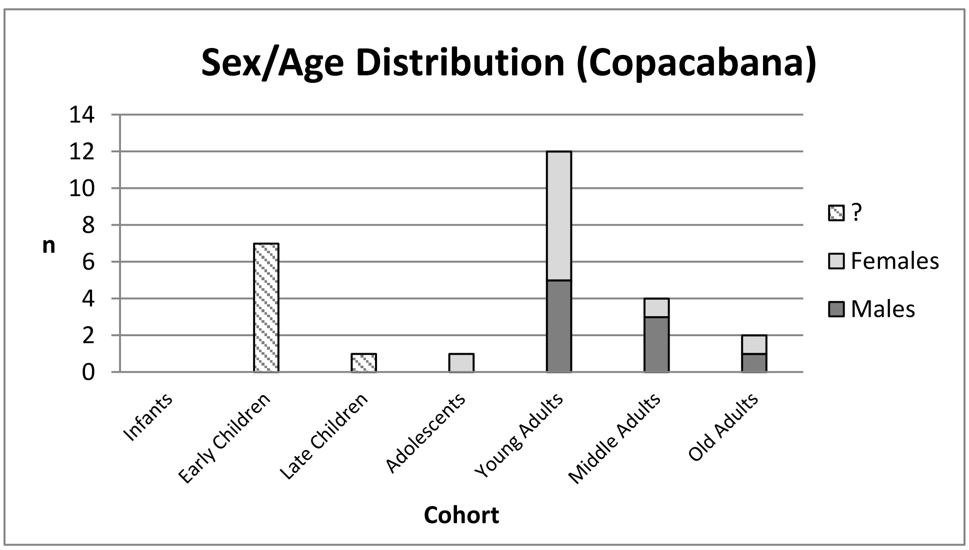

Figure 5.67: Sex and Age Distribution at the Site of Copacabana

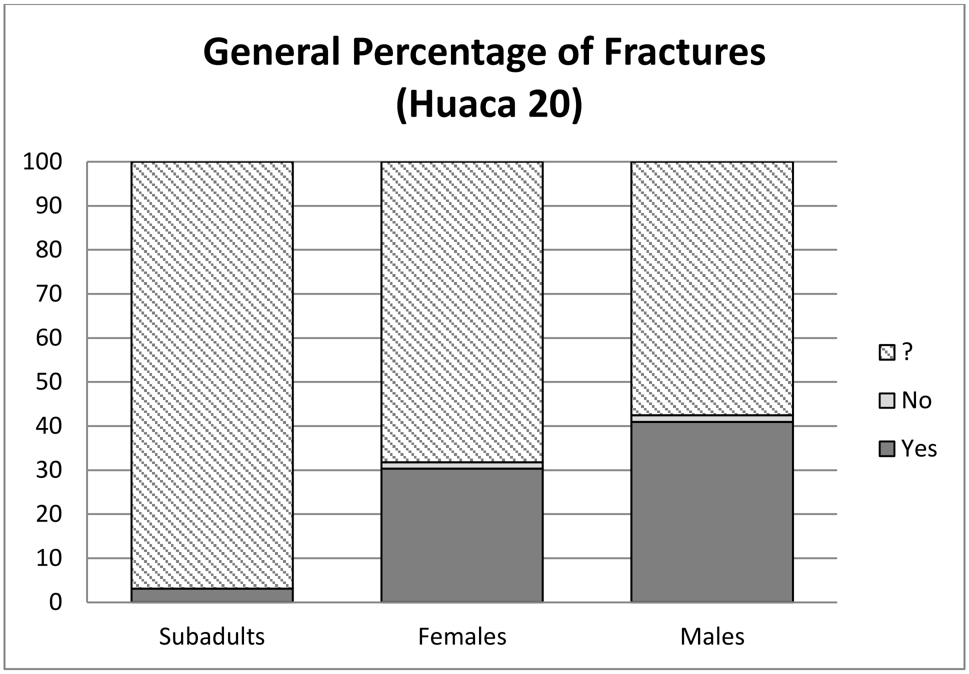

Figure 5.68: General Percentage of Fractures in Subadults, Females, and Males from Huaca 20

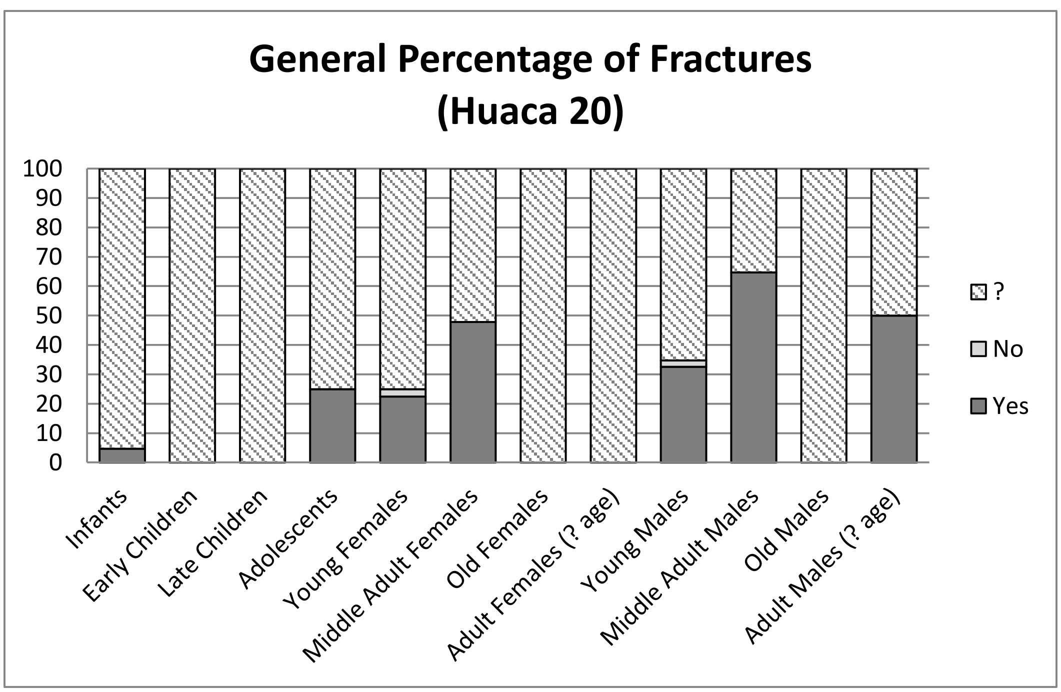

Figure 5.69: General Percentage of Fractures by Age Cohort at the Site of Huaca 20

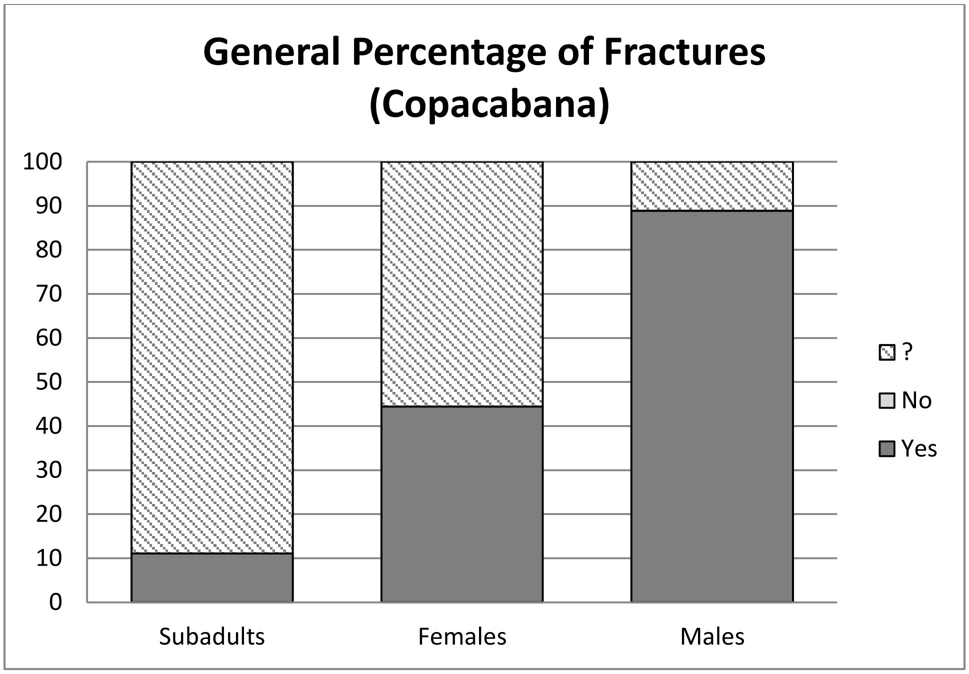

Figure 5.70: General Percentage of Fractures in Subadults, Females, and Males from Copacabana

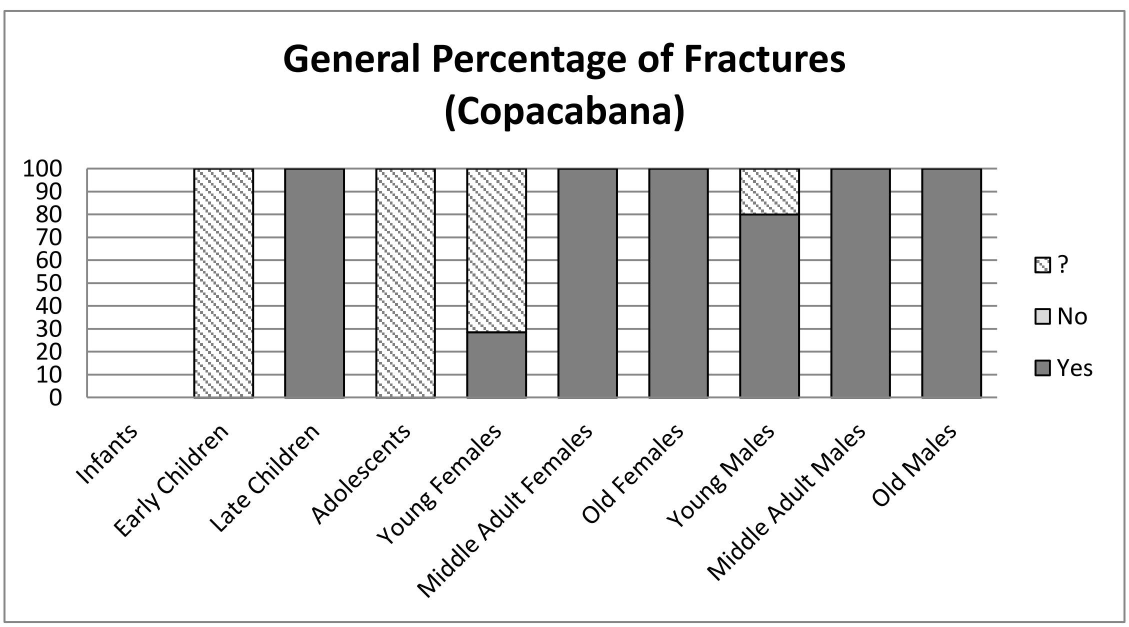

Figure 5.71: General Percentage of Fractures by Age Cohort at the Site of Copacabana

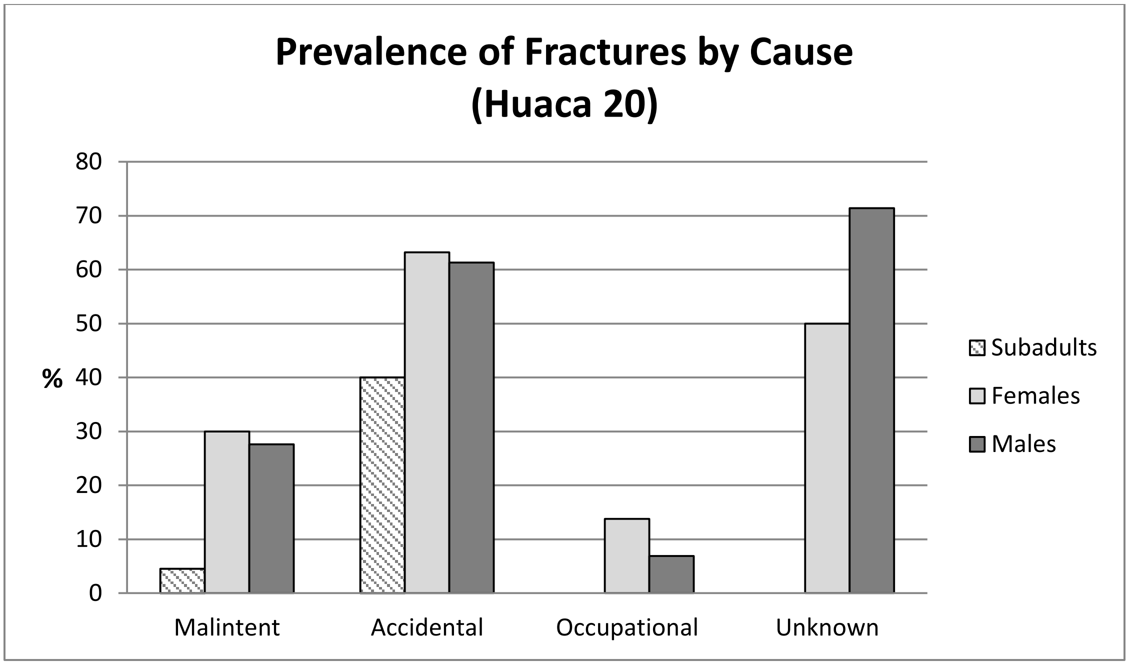

Figure 5.72: Prevalence of Fractures by Most Probable Cause at the Site of Huaca 20

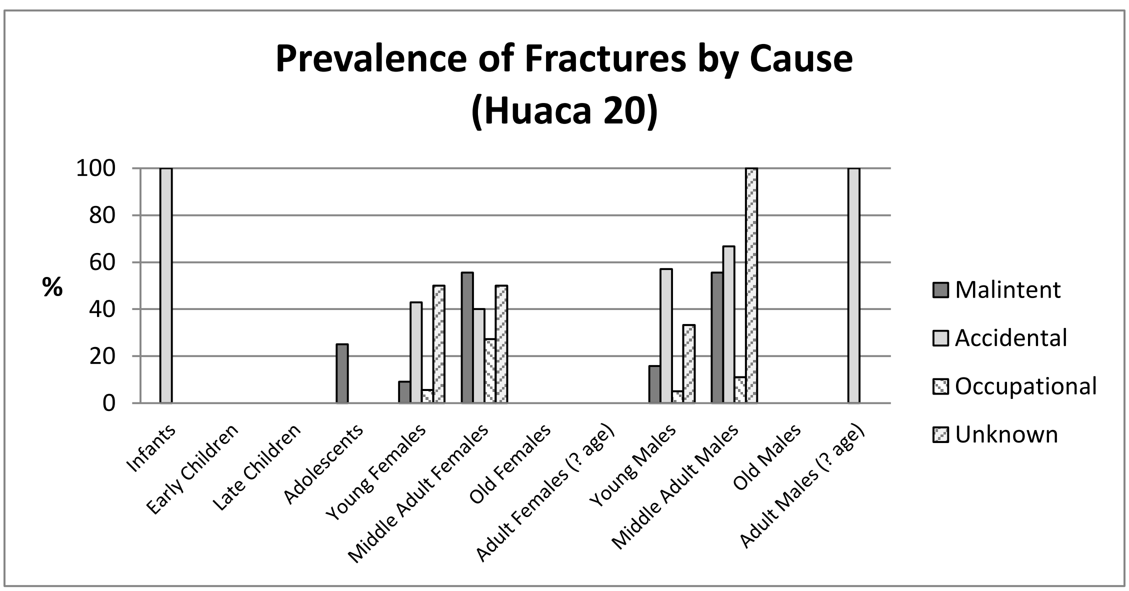

Figure 5.73: Most Probable Cause of Fractures by Age Cohort at the Site of Huaca 20

Figure 5.74: Spondylolysis of L5 (Huaca 20, T 151, Middle Adult Female)

Figure 5.75: Healed Fracture on the Angle of a Left Rib
(Huaca 20, CF 24, Middle Adult Male)

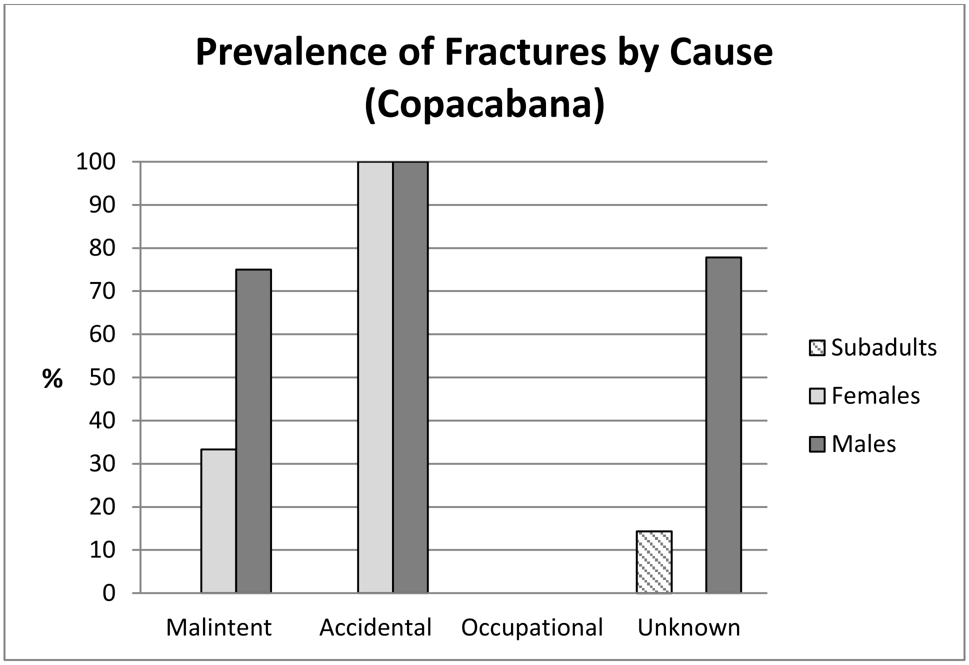

Figure 5.76: Prevalence of Fractures by Most Probable Cause at the Site of Copacabana

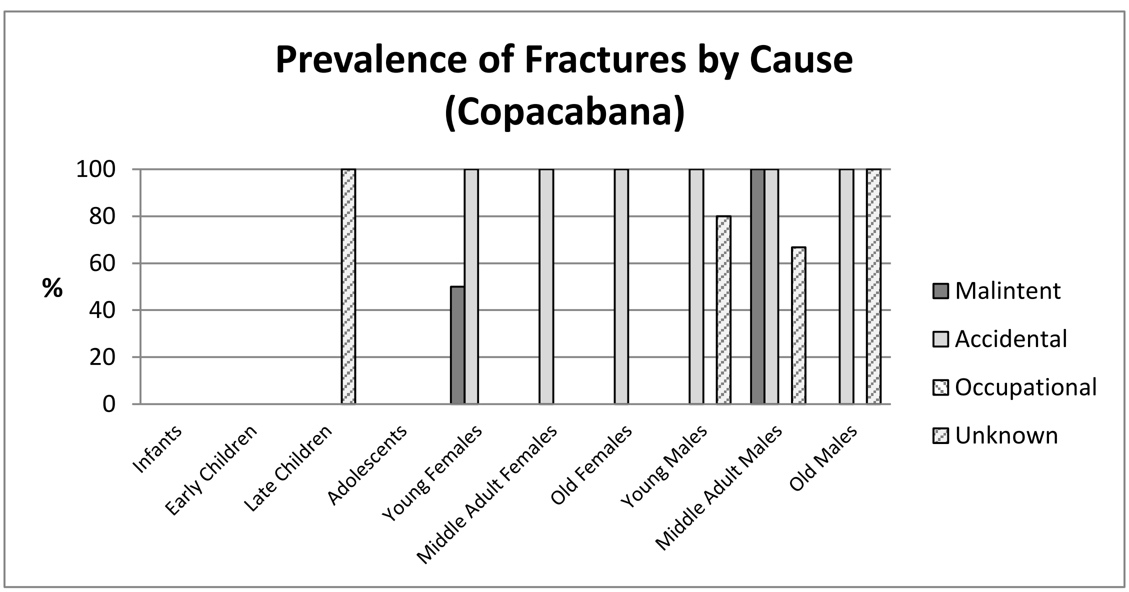

Figure 5.77: Most Probable Cause of Fractures by Age Cohort at the Site of Copacabana

Figure 5.78: Sternal Antemortem Fracture of the Right 3rd Rib (Copacabana B19 E1, Young Male)

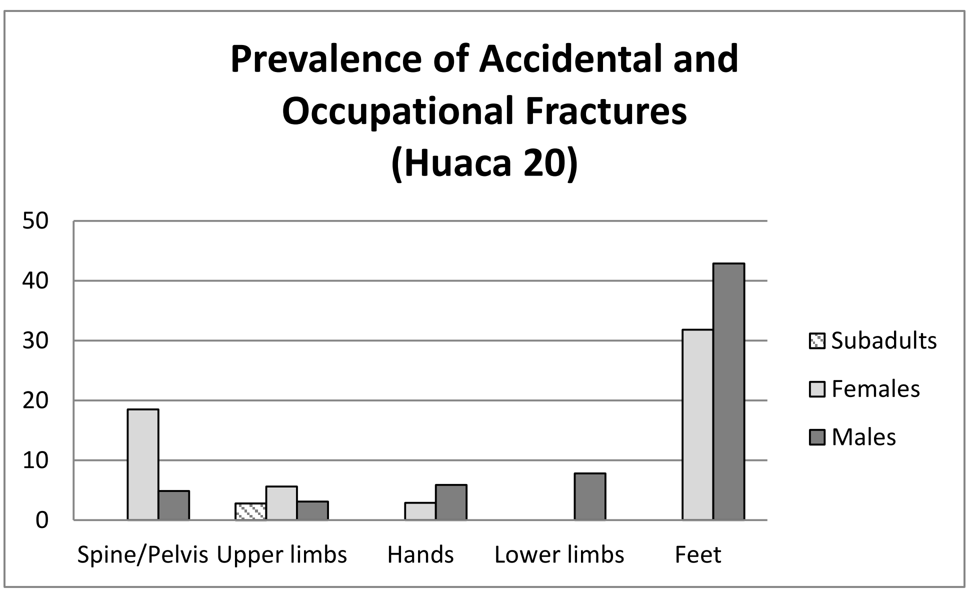

Figure 5.79: Prevalence of Accidental and Occupational Fractures by Location at the Site of Huaca 20

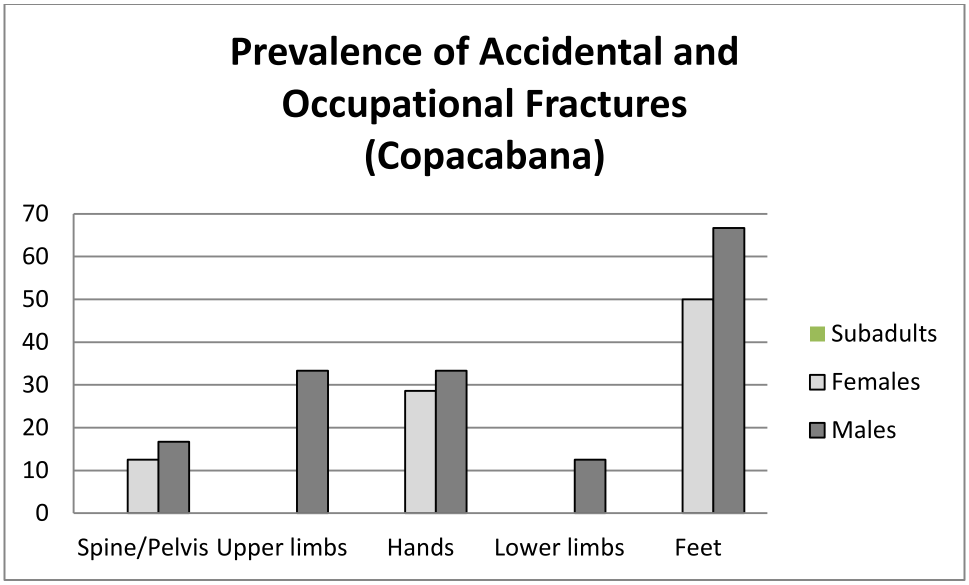

Figure 5.80: Prevalence of Accidental and Occupational Fractures by Location at the Site of Copacabana

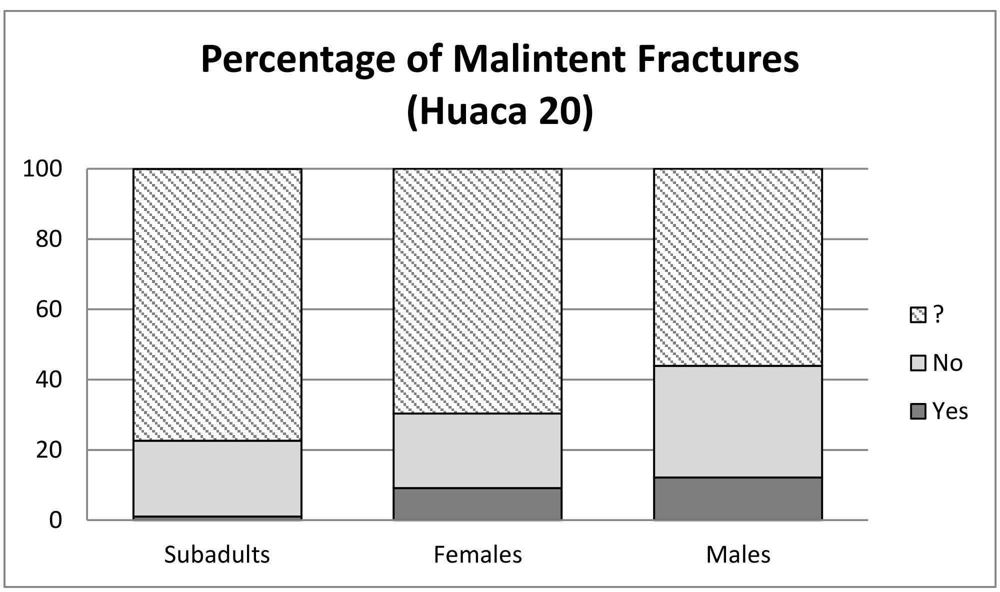

Figure 5.81: Percentage of Malintent Fractures at the Site of Huaca 20

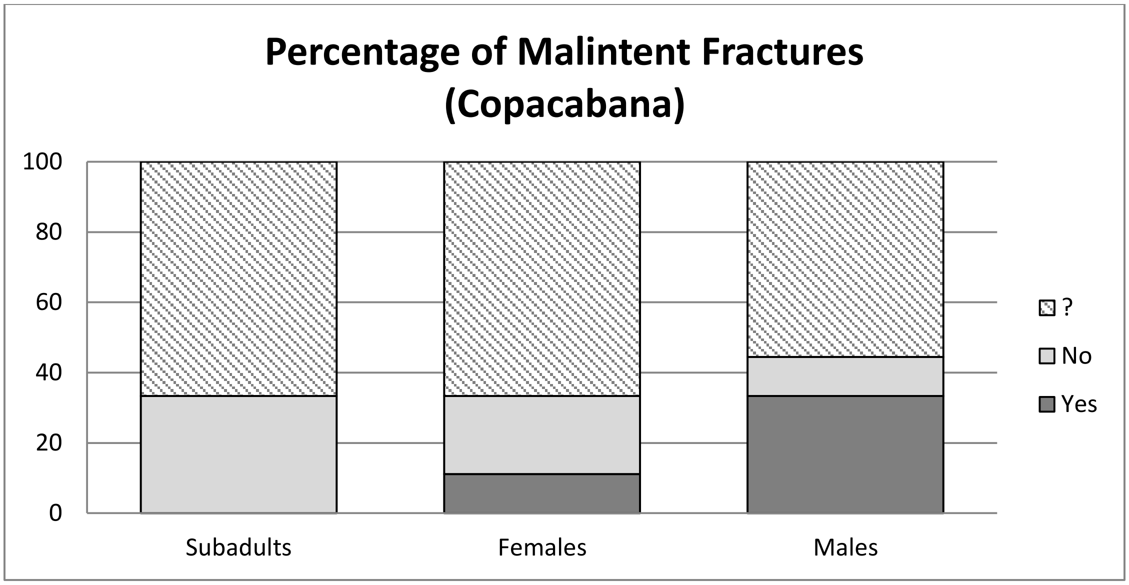

Figure 5.82: Percentage of Malintent Fractures at the Site of Copacabana

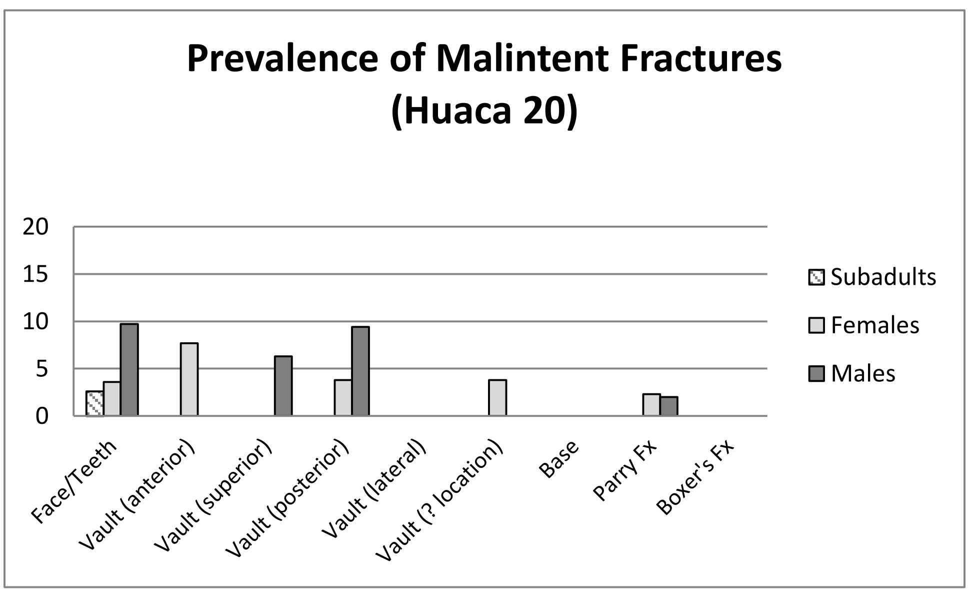

Figure 5.83: Prevalence of Malintent Fractures by Location/Type at the Site of Huaca 20

Figure 5.84: Healed Fracture in the Right Side of the Frontal (Huaca 20, T 350, Young Male)

Figure 5.85: Healed Fractures on the Left and Right Parietals (Huaca 20, CF 24, Middle Adult Male)

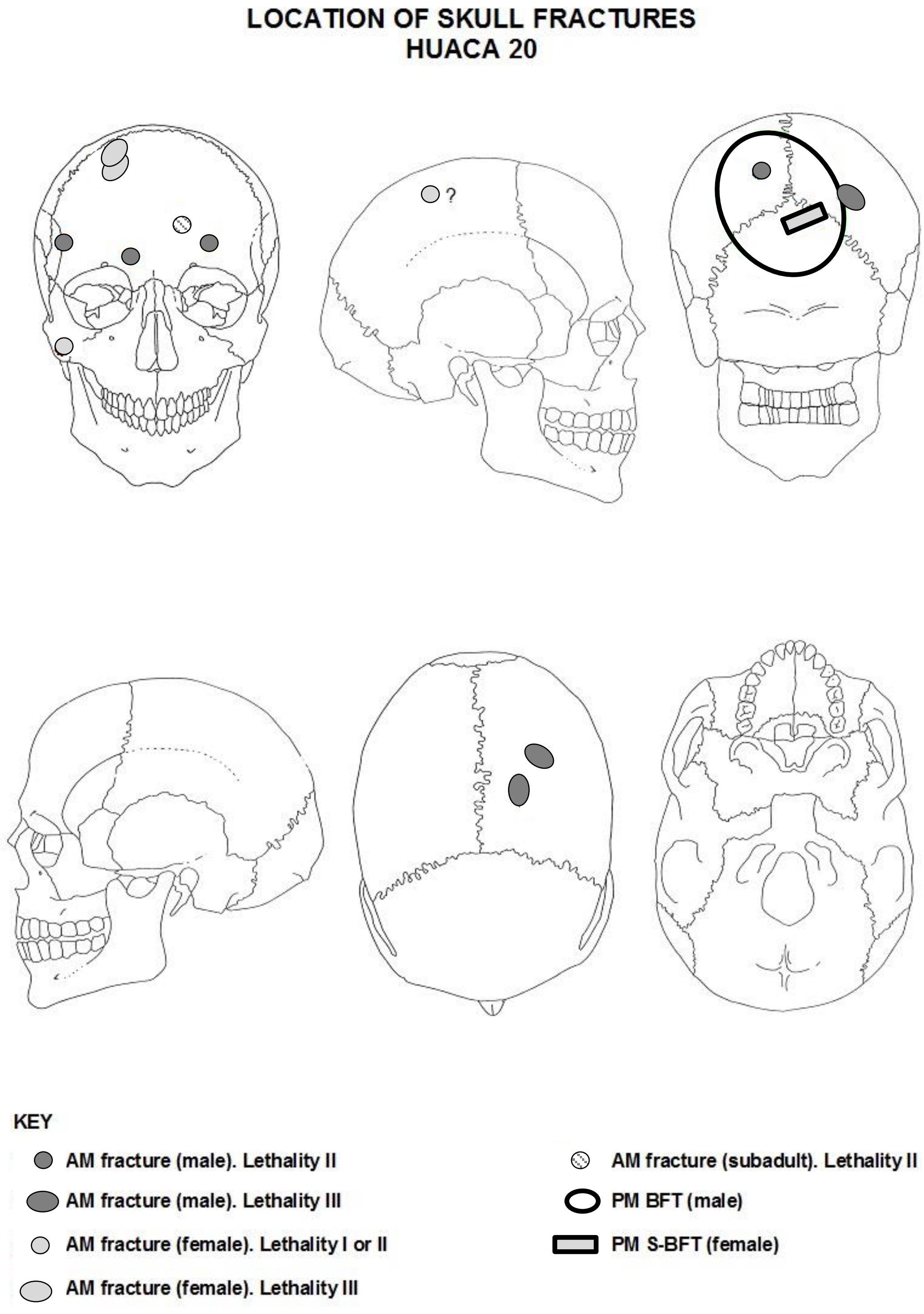

Figure 5.86: Location of Skull Fractures at the Site of Huaca 20 Based on Thirteen Individuals. Skull Sketches after Buikstra and Ubelaker (1994)

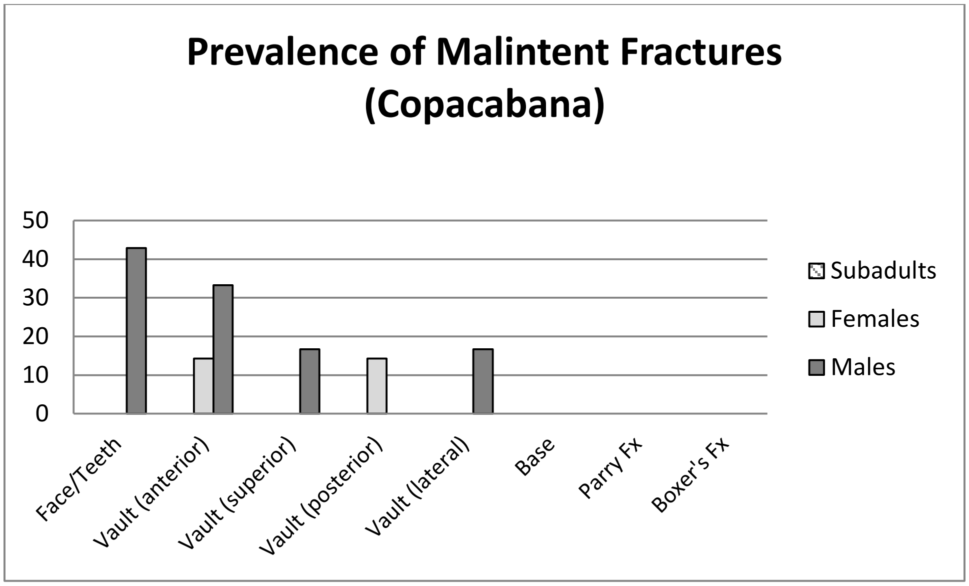

Figure 5.87: Prevalence of Malintent Fractures by Location/Type at the Site of Copacabana

Figure 5.88: Healed Fracture on the Right Supraorbital Margin (Copacabana, B04 E1, Middle Adult Male). Photo by Franco Mora

Figure 5.89: Healed Fractures on the Left and Right Sides of the Frontal (Copacabana, B11 E1, Middle Adult Male). Photo by Franco Mora

Figure 5.90: Healed Fractures on the Left Side of the Frontal and Posterior Area of the Right Parietal (Copacabana, B12 E1, Young Female). Photo by Franco Mora

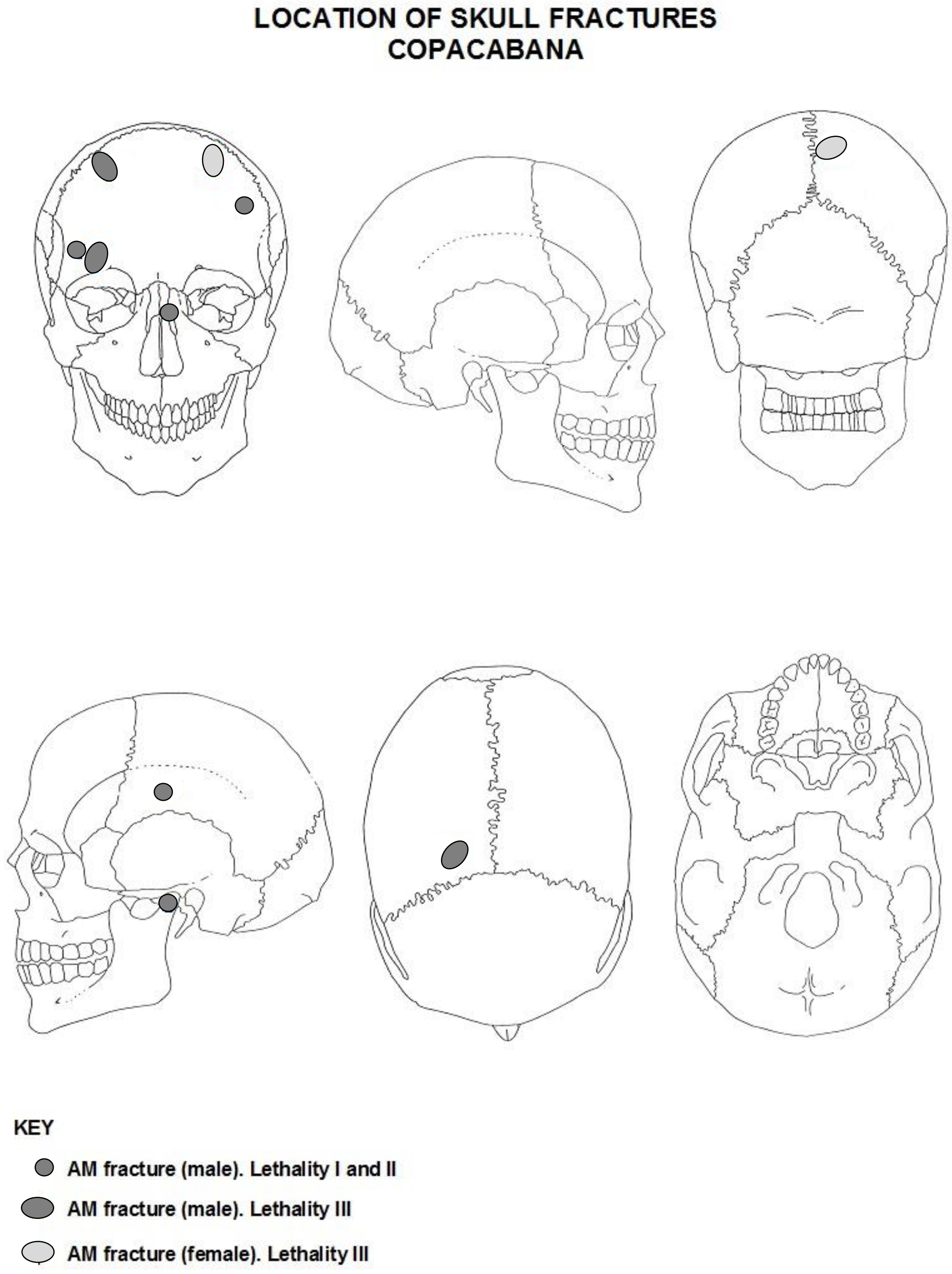

Figure 5.91: Location of Skull Fractures at the Site of Copacabana Based on Four Individuals. Skull Sketches after Buikstra and Ubelaker (1994)

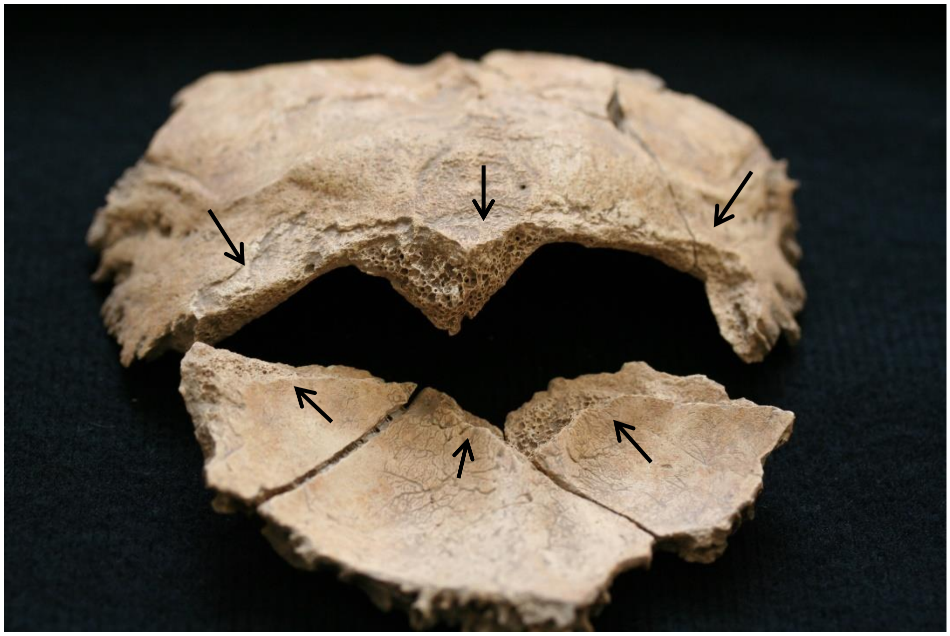

Figure 5.92: Perimortem Fracture (BFT) to the Occipital (Huaca 20, T 318, Middle Adult Male)

Figure 5.93: Perimortem Fracture (S-BFT) to the Lambdatic Bone (Huaca 20, T 406, Middle Adult Female)

Figure 5.94: Antemortem Fracture (Close to the Death) with Smooth Edges and Little Reactive Bone Formation on the Neck of a Right Rib (Copacabana, B12 E2, Late Child)

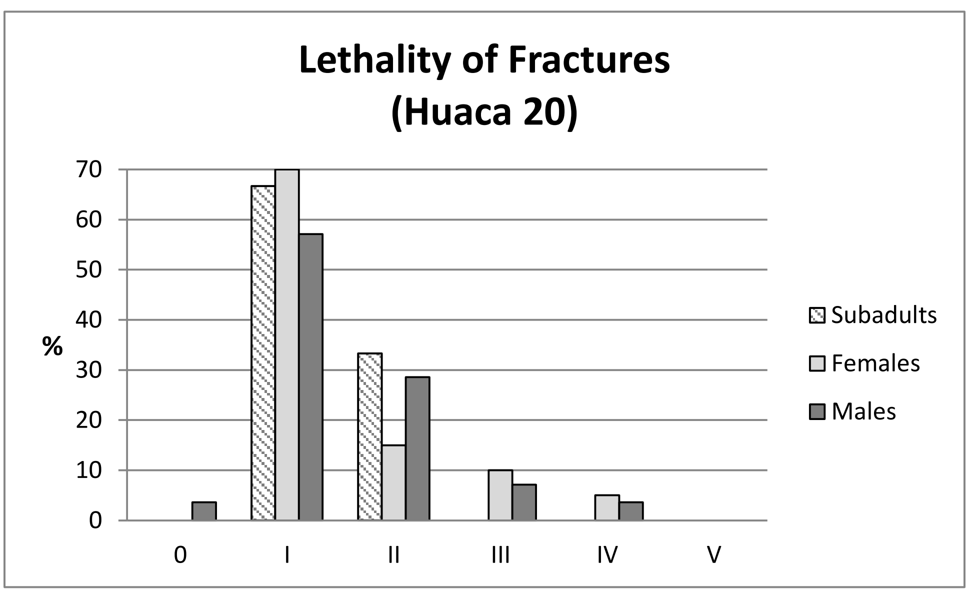

Figure 5.95: Prevalence of Fractures by Lethality at the Site of Huaca 20

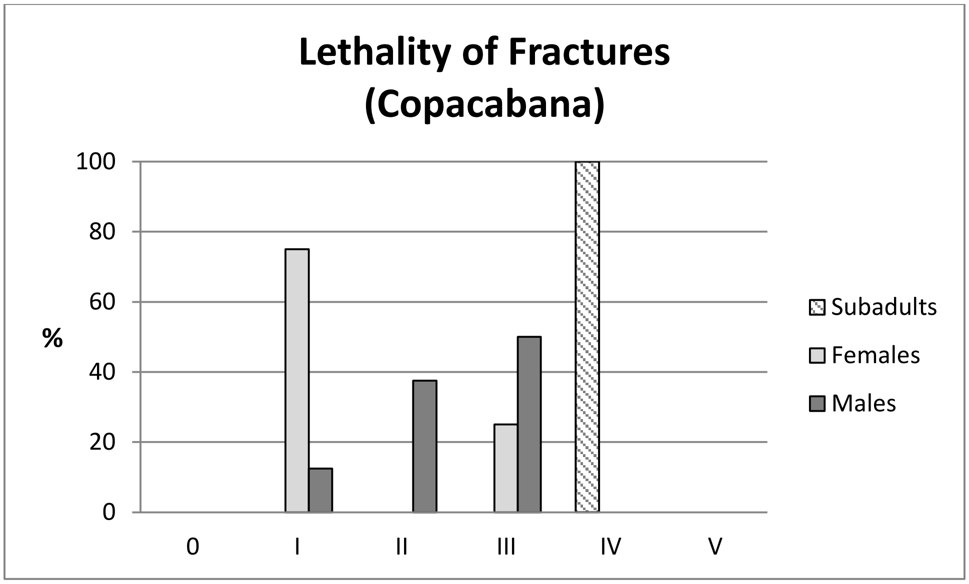

Figure 5.96: Prevalence of Fractures by Lethality at the Site of Copacabana

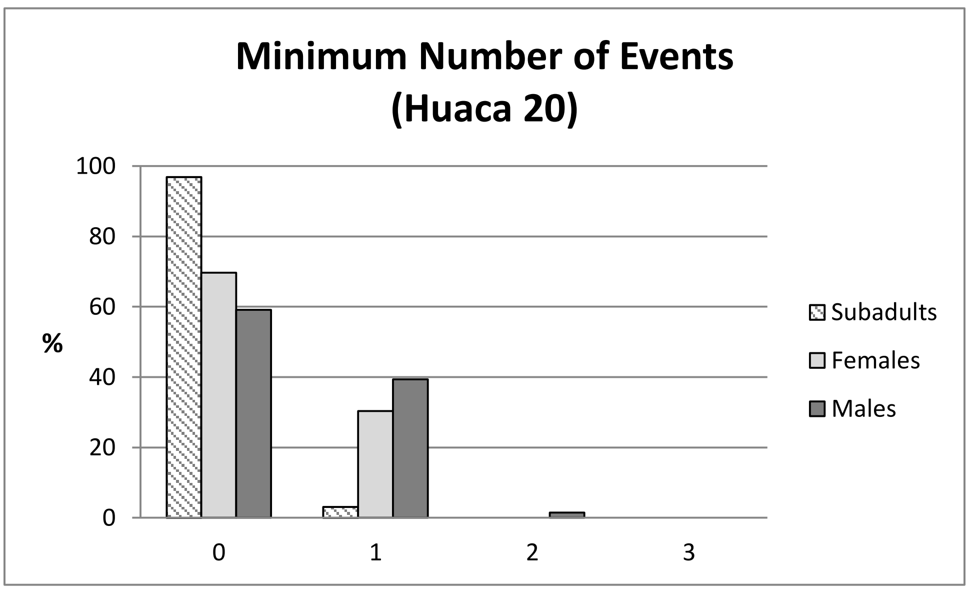

Figure 5.97: Minimum Number of Events at the Site of Huaca 20

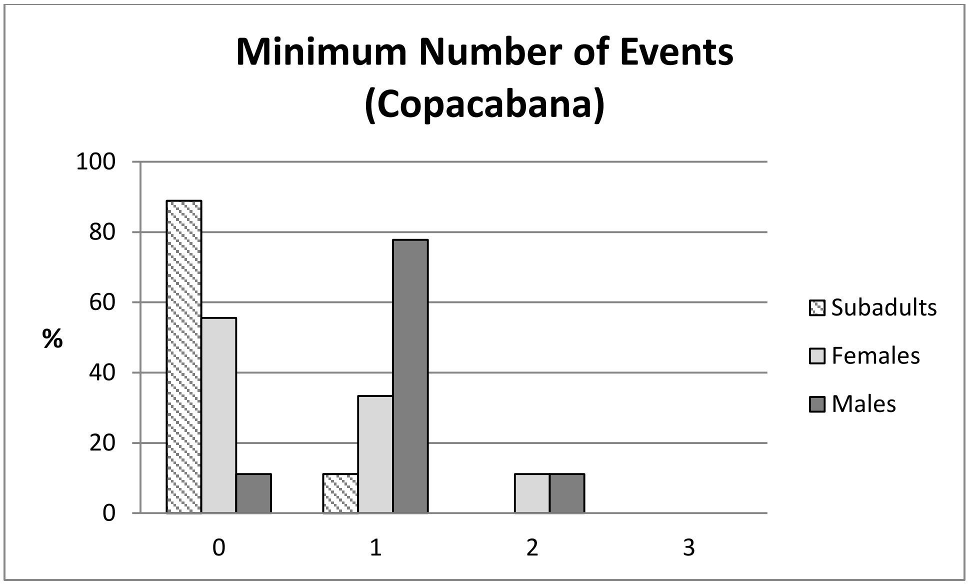

Figure 5.98: Minimum Number of Events at the Site of Copacabana

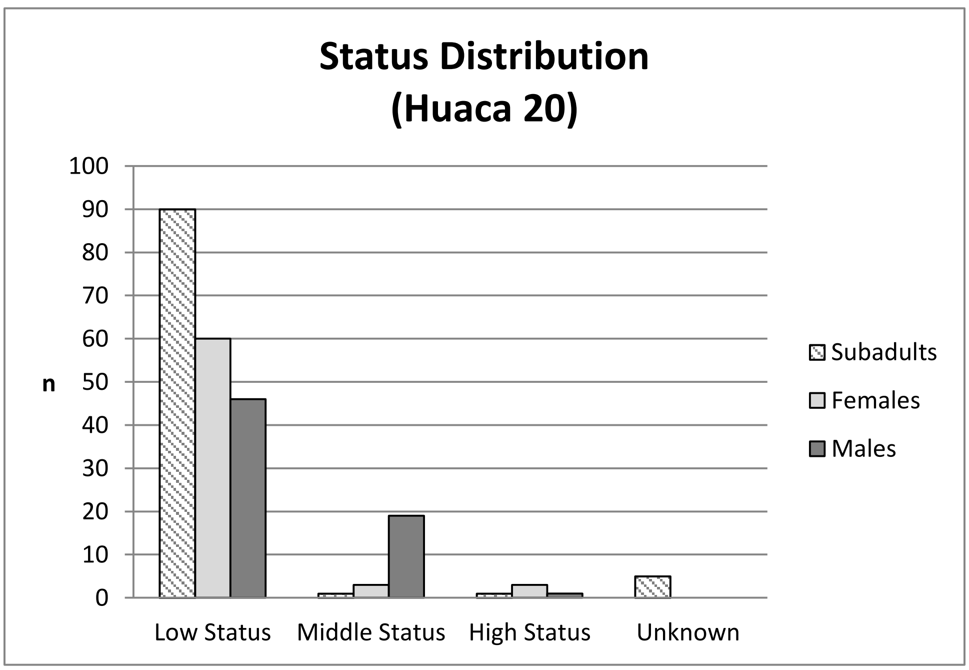

Figure 5.99: Status Distribution at the Site of Huaca 20

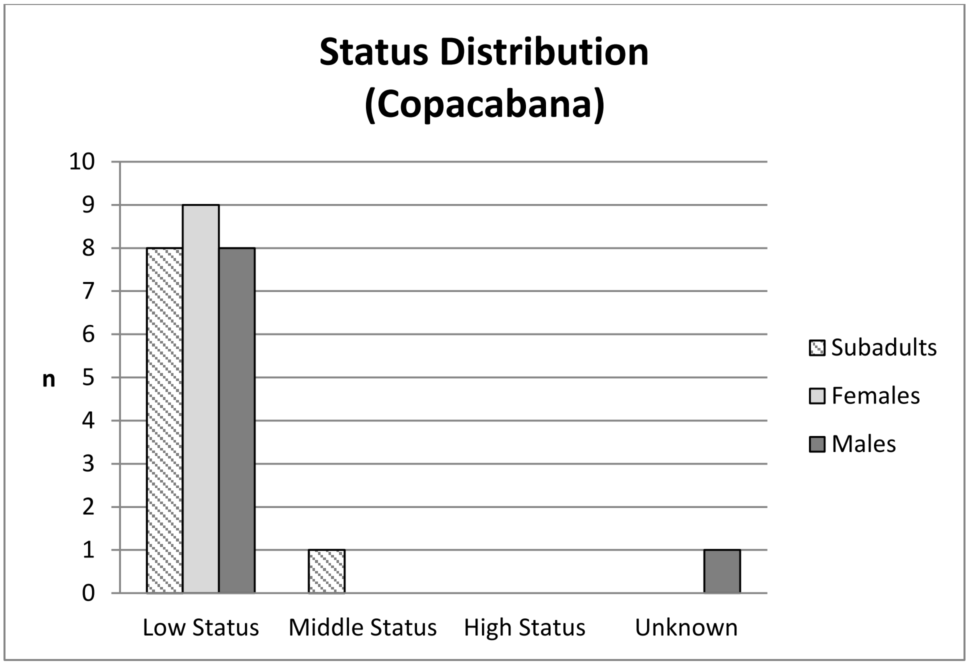

Figure 5.100: Status Distribution at the Site of Copacabana

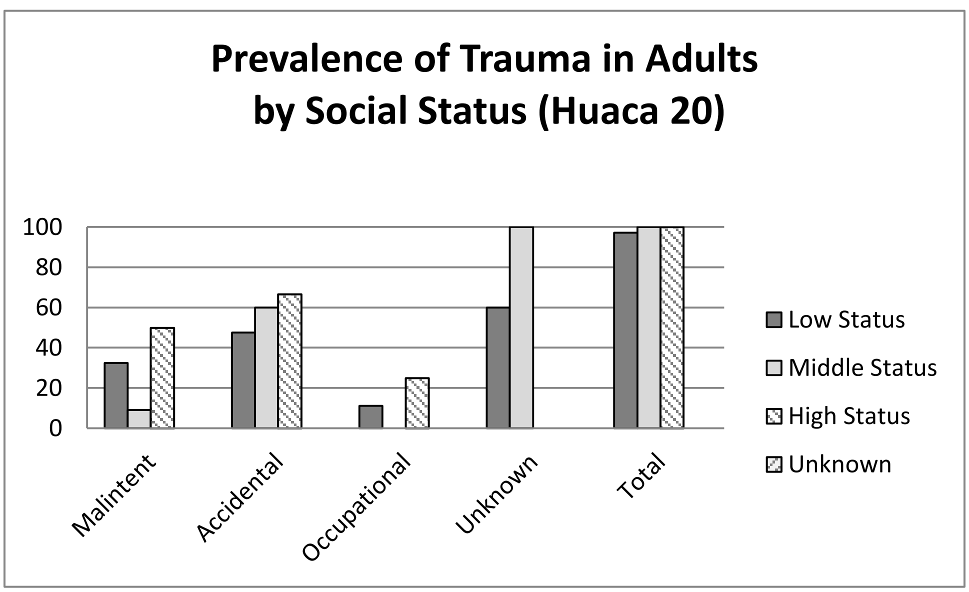

Figure 5.101: Prevalence of Trauma in Adults by Social Status at the Site of Huaca 20

5.5 Middle Horizon 3-4 Period

The Middle Horizon 3-4 sample was represented by one sample, Ancón (n = 30), recovered in 1994 by Kauffmann, and analyzed by the author.

Despite being small, the Ancón sample from the MH 3-4 showed the expected age cohort distribution for an archaeological assemblage (see Chamberlain 2006; Séguy et al. 2008; Wood et al. 2002), with a high percentage of infants (36.7%, n = 11) and an equal male-female ratio (Figure 5.102).

At least 80% (n = 4/5) of the females, 83.3% (n = 5/6) of the males, and 5.3% (n = 1/19) of the subadults presented some kind of trauma (Figure 5.103). These rates rose to 100% (n = 9/9) in adults and 33.3% (n = 1/3) in subadults when only observable cases were included. The small number of individuals in the adult age cohorts makes it difficult to determine if there is a clear relation between age and rate of trauma (Figure 5.104). The most common kinds of trauma were accidental and malintent in males (100%, n = 2/2 and 80%, n = 4/5 respectively), and accidental in females (75%, n = 3/4). The only subadult individual with a traumatic lesion, a female adolescent of 15-17 years, demonstrated a rib fracture (Figures 5.105 to 5.107). As was seen in the previous time period, the foot was the most common location for accidental trauma in adults (especially in females) (Figures 5.108 and 5.109).

The prevalence of malintent trauma in males was higher than in females (80% – n = 4/5 vs. 25% – n = 1/4, odds ratio = 12 – 95% CI 0.51-280.11), which resembles the prevalence found in the site of Copacabana from the beginning of the Middle Horizon (Late Lima). There were no cases of malintent trauma in subadults. However, the poor preservation of the vault in almost one quarter of this subsample could be hiding some fractures (Figure 5.110).

All the males with malintent trauma demonstrated injuries to the facial area (80% of prevalence, n = 4/5), which contrasts dramatically with the females, who demonstrated no fractures in that zone (n = 0/5). This difference in the location of the lesions between sexes was statistically significant (odds ratio = 33 – 95% CI 1.06-1023.62)[94] (Figures 5.111 to 5.113). This preference to harm the facial area was also found in the Late Lima samples.

Although the majority of lesions were catalogued as of low or moderate lethality, there were two cases (a male and a female) with fatal wounds (Figure 5.114). The first case was a young male with a perimortem sharp-blunt trauma to the lateral-anterior part of the right parietal (close to the coronal suture), comminution of the facial area, and possible perimortem fractures on teeth and some ribs. The fact that this individual was missing bones such as the right tibia, fibula, and foot, some hand phalanges, and the left innominate, and featured an abnormal bone position suggests that this was a secondary burial (see Cornejo et al. 1994:51) (Figures 5.115 to 5.118). The other case was an old female retainer with a perimortem blunt force trauma to the left side of the skull, which affected the left parietal, the occipital and the left zygomatic (Figure 5.119). This isolated but huge lesion, as well as the location of the individual at the entrance of a collective burial, suggests that this female could be part a sacrifice ritual. Nevertheless, the absence of some bones (i.e. left foot and fibula, many hands and right foot bones, both patellae, one rib, and C1, C5, L2 and L3) also indicates that this was another secondary burial. Thus, it is not clear if the female was sacrificed or was killed in a different event, buried in another area and then reburied to join the main individual of the burial.

The MNEv was predominantly 0 among subadults and 1 in adults, with occasional cases of repetitive trauma in the latter (Figure 5.120).

Most of the individuals were catalogued as “low status” (53.3%, n = 14), a group composed almost exclusively of infants and children. This was followed by the “high status” group (33.3%, n = 10), composed mostly of males. The remaining individuals were included in the “middle status” segment (Figure 5.121). Four retainers (two old females and two infants) were also identified. Most of the females were associated with textile instruments while many of the males were buried with weapons. Most of the cases

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[94] Fisher’s exact probability test: P=.048 (two-tailed)

of fractures were from the “high status” group, which was not surprising, considering that most of the adults concentrated in this social segment (Figure 5.122). The small number of adults in the other two groups did not allow for comparisons between social status segments to be made.

To sum up, almost every adult in the Ancón sample presented at least one traumatic injury. As was seen in the previous time period, accidental fractures, especially on the foot, were the most common kind of trauma in adults.

The prevalence of malintent trauma was higher in males (80%, n = 4/5 vs. 25%, n = 1/4 in females) and was absent in subadults. The prevalence of malintent trauma in adults and the location of the fractures in the facial area among males were similar to what was found in the Late Lima site of Copacabana. Repetitive trauma was rare. Fatal wounds were present in two special cases: a female retainer and a male secondary burial, both possibly recovered from another area and reburied at Ancón.

More than half of the adults of the sample were classified as belonging to the high status group. Males appeared to be associated with military activities and females with weaving.

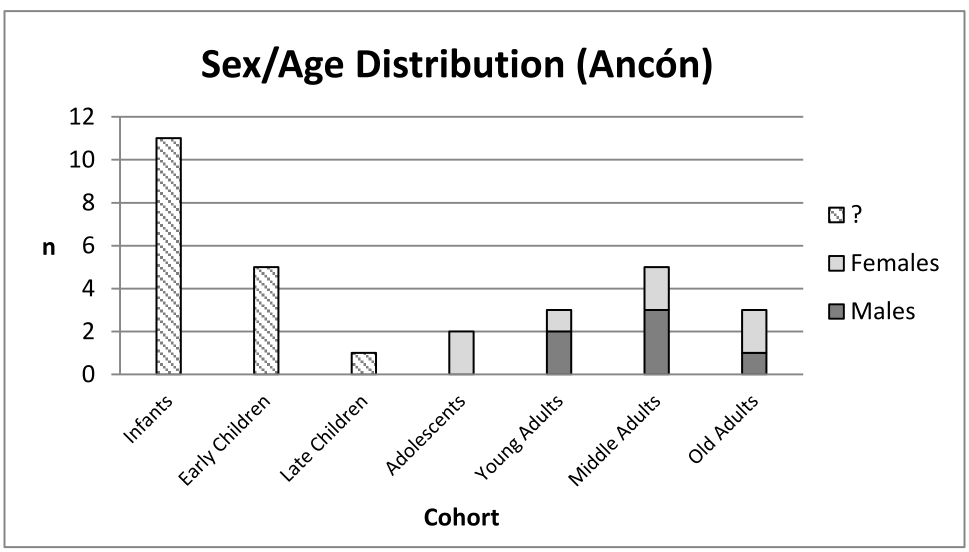

Figure 5.102: Sex and Age Distribution at the Site of Ancón

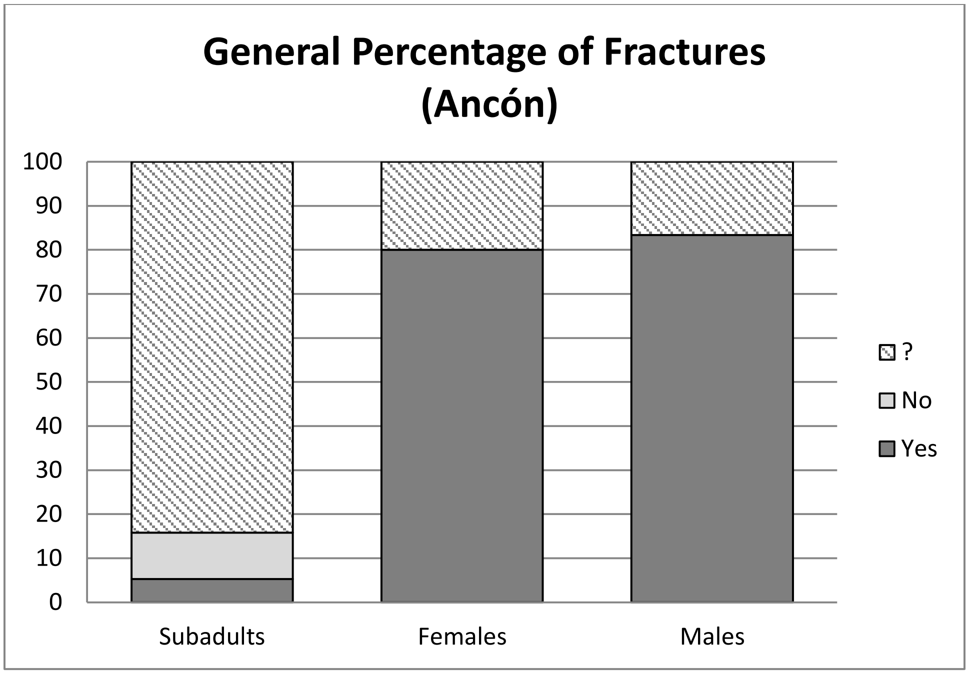

Figure 5.103: General Percentage of Fractures in Subadults, Females, and Males from Ancón

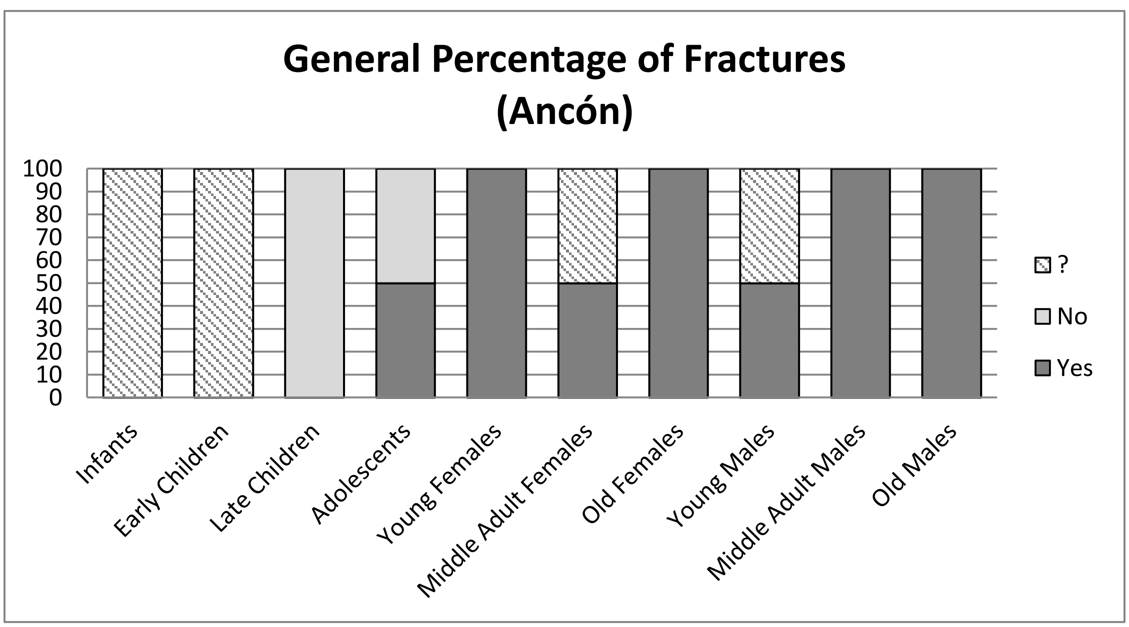

Figure 5.104: General Percentage of Fractures by Age Cohort at the Site of Ancón

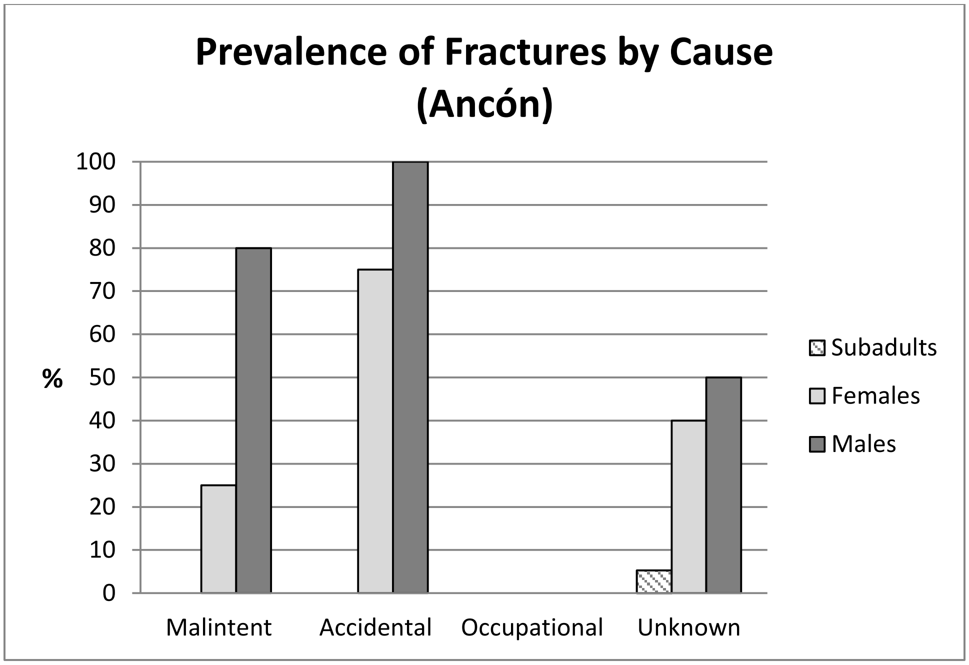

Figure 5.105: Prevalence of Fractures by Most Probable Cause at the Site of Ancón

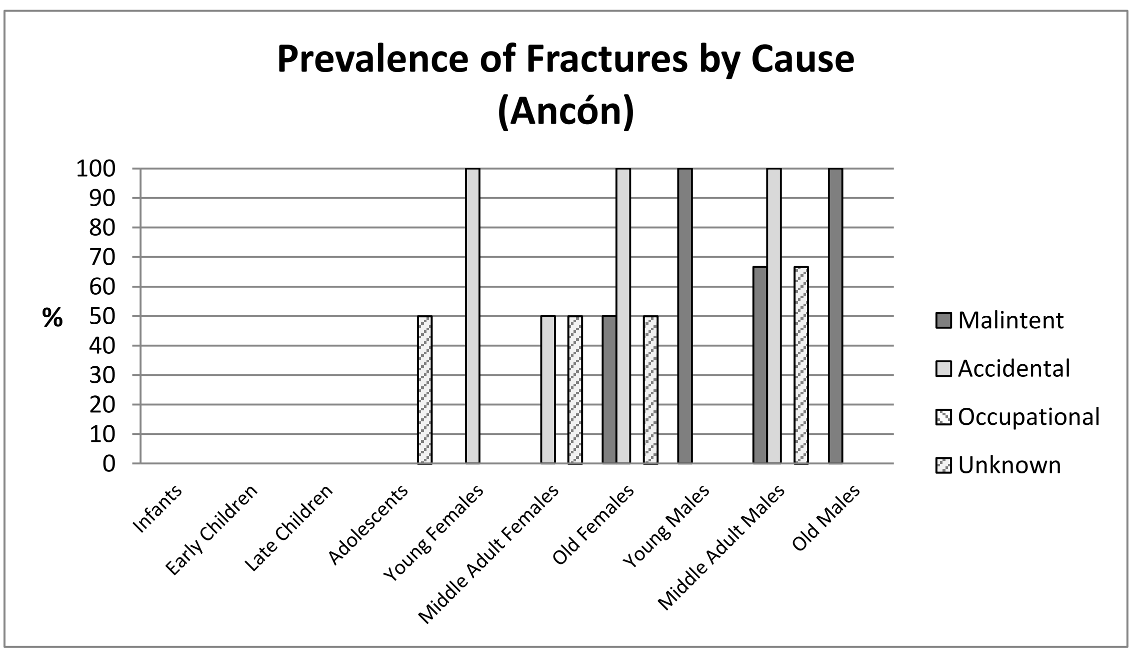

Figure 5.106: Most Probable Cause of Fractures by Age Cohort at the Site of Ancón

Figure 5.107: Sternal Antemortem Fracture of the Left 11th Rib (Ancón CF 03-II, Female Adolescent)

Figure 5.108: Antemortem Fracture on the Proximal Articular Facet of the 3rd? Middle Phalange of the Right Foot (Ancón, CF 14-I, Middle Adult Female)

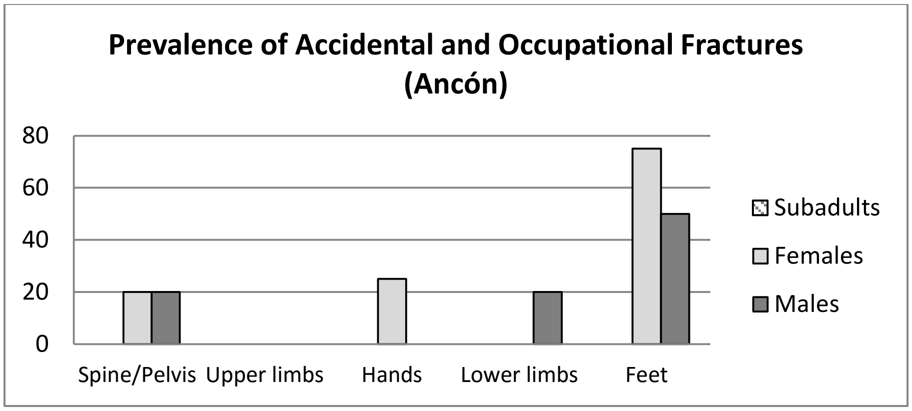

Figure 5.109: Prevalence of Accidental and Occupational Fractures by Location at the Site of Ancón

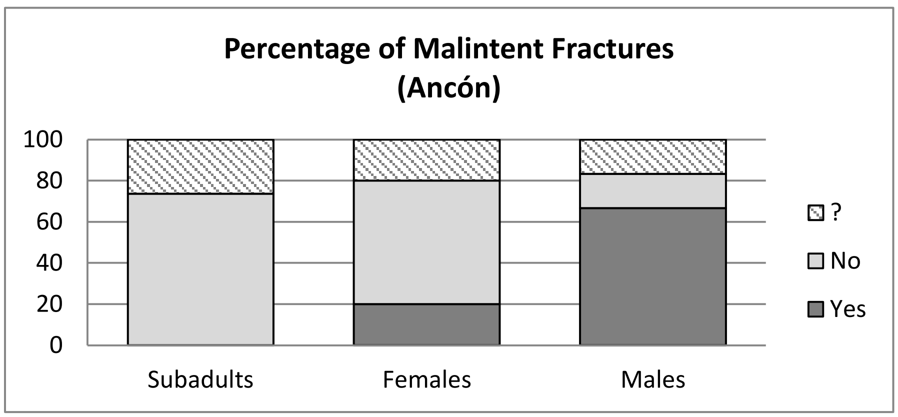

Figure 5.110: Percentage of Malintent Fractures at the Site of Ancón

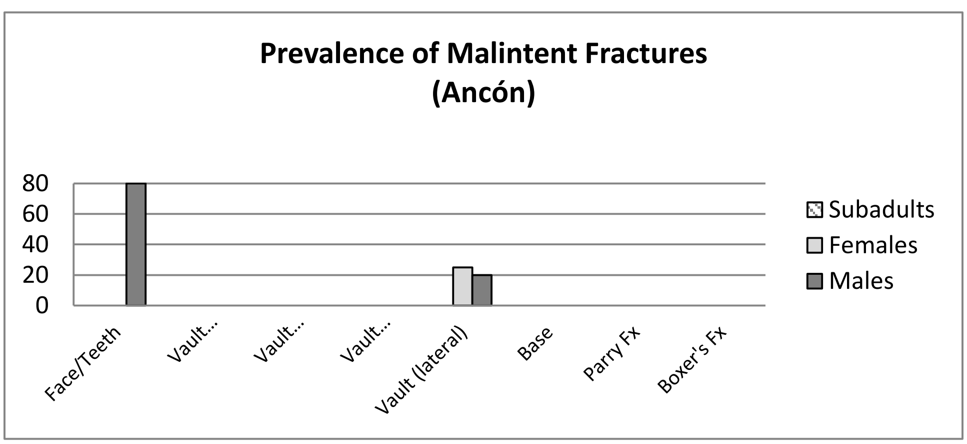

Figure 5.111: Prevalence of Malintent Fractures by Location/Type at the Site of Ancón

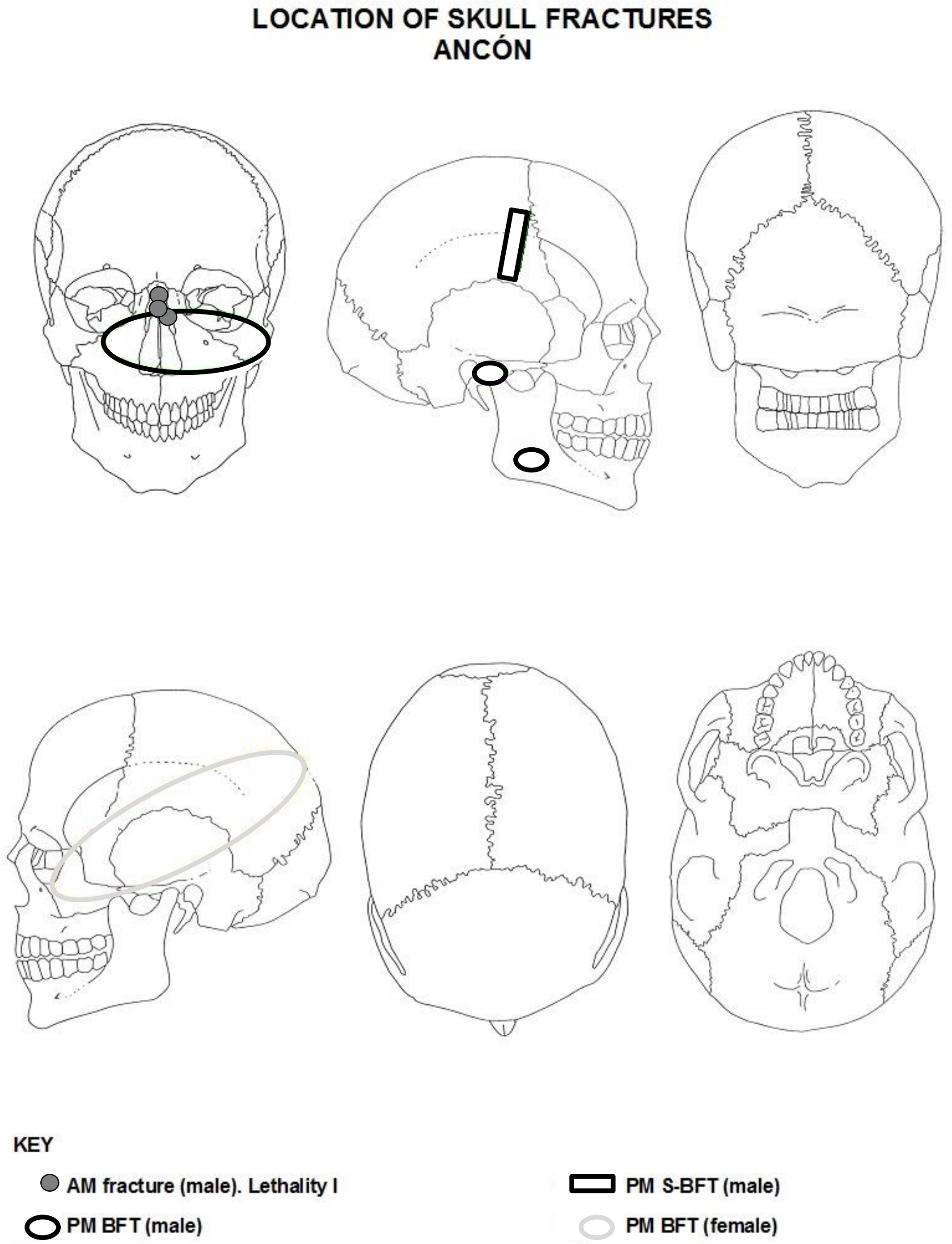

Figure 5.112: Location of Skull Fractures at the Site of Ancón Based on Five Individuals. Skull Sketches after Buikstra and Ubelaker (1994)

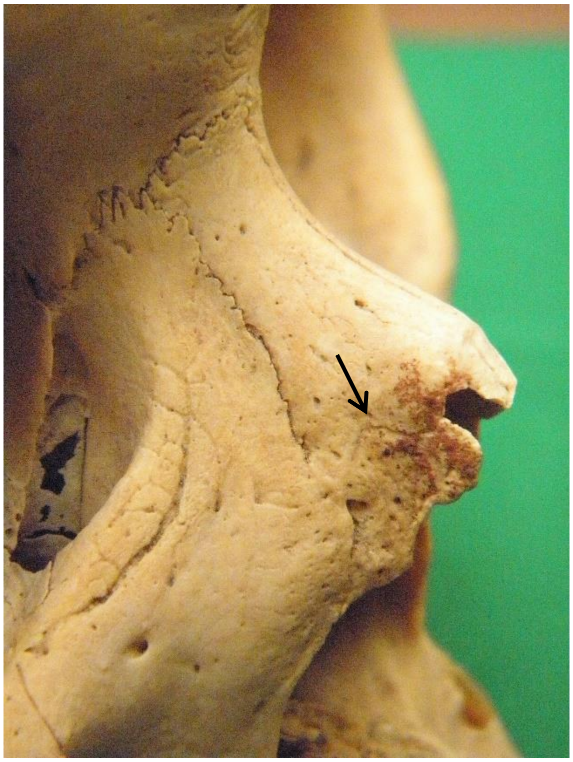

Figure 5.113: Antemortem Fracture of the Right Nasal (Ancón, CF 08-II, Middle Adult Male)

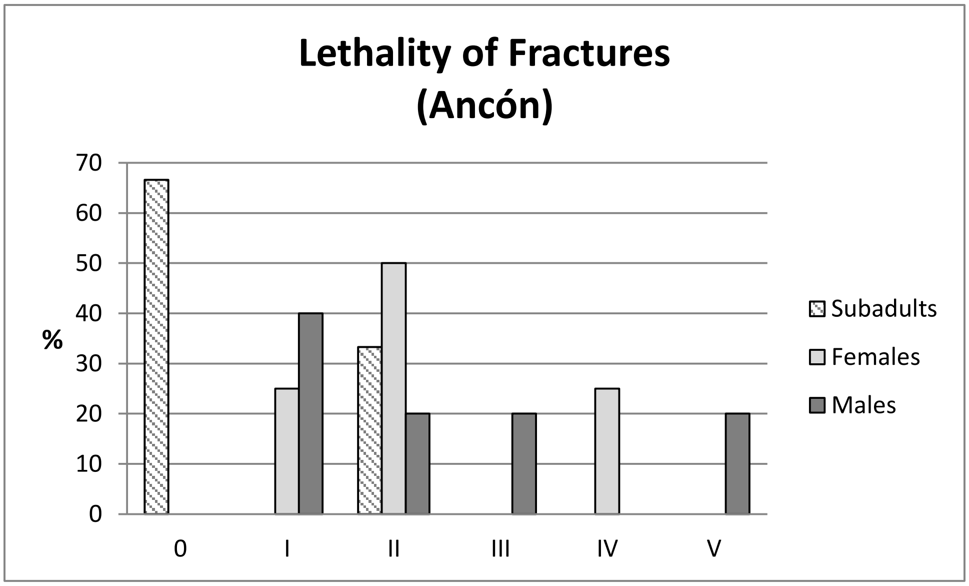

Figure 5.114: Prevalence of Fractures by Lethality at the Site of Ancón

Figure 5.115: Perimortem Comminution of the Facial Bones (Ancón, CF 18, Young Male)

Figure 5.116: Perimortem Mandibular Fracture on the Right Side of the Body (Ancón, CF 18, Young Male)

Figure 5.117: Perimortem Fracture (S-BFT) to the Right Parietal (Ancón, CF 18, Young Male)

Figure 5.118: Close-up View of Perimortem Fracture (B-SFT) to the Right Parietal (Ancón, CF 18, Young Male)

Figure 5.119: Perimortem Fracture (BFT) to the Left Side of the Skull (Ancón, CF 08-Y, Old Female)

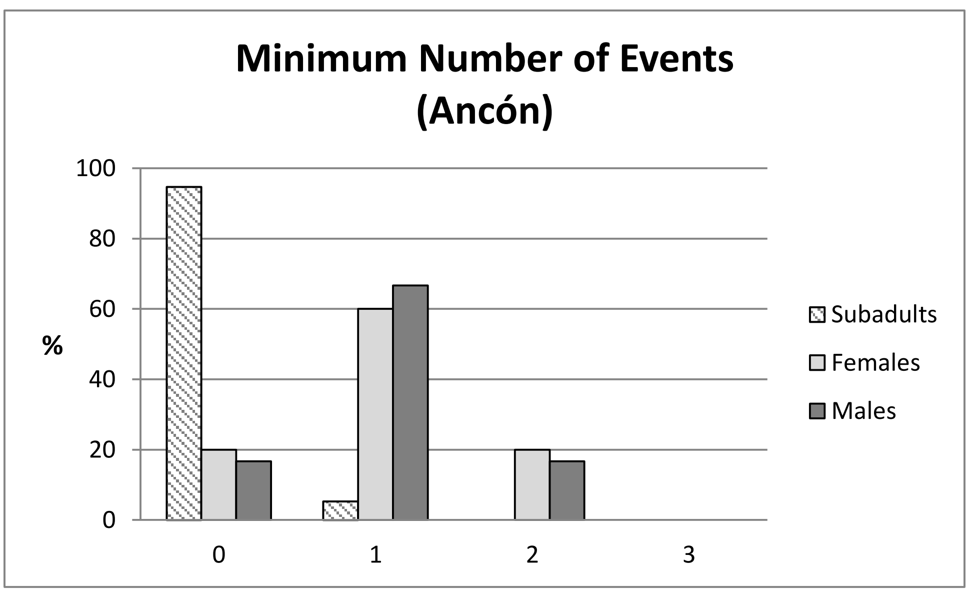

Figure 5.120: Minimum Number of Events at the Site of Ancón

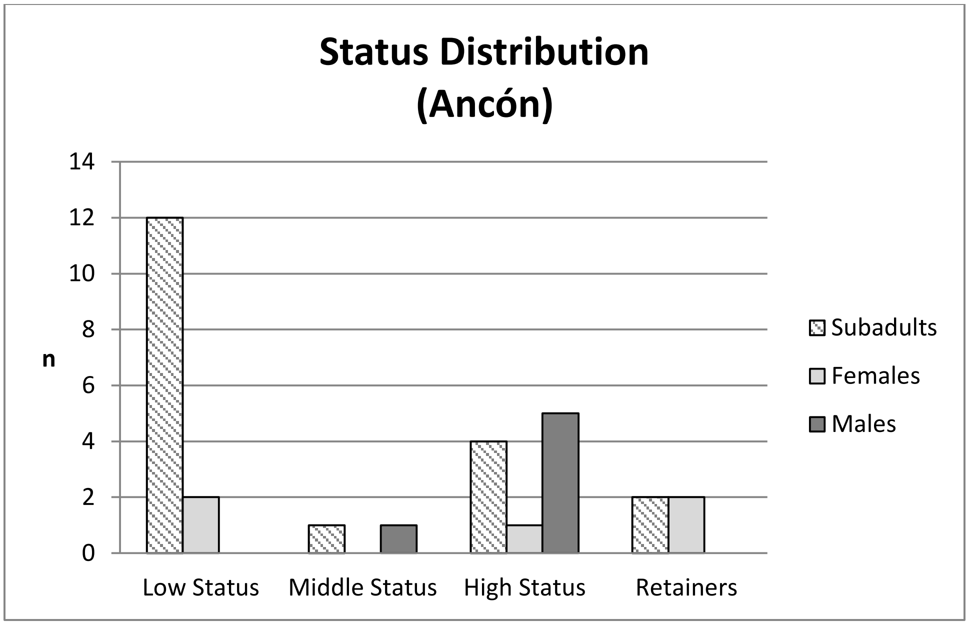

Figure 5.121: Status Distribution at the Site of Ancón

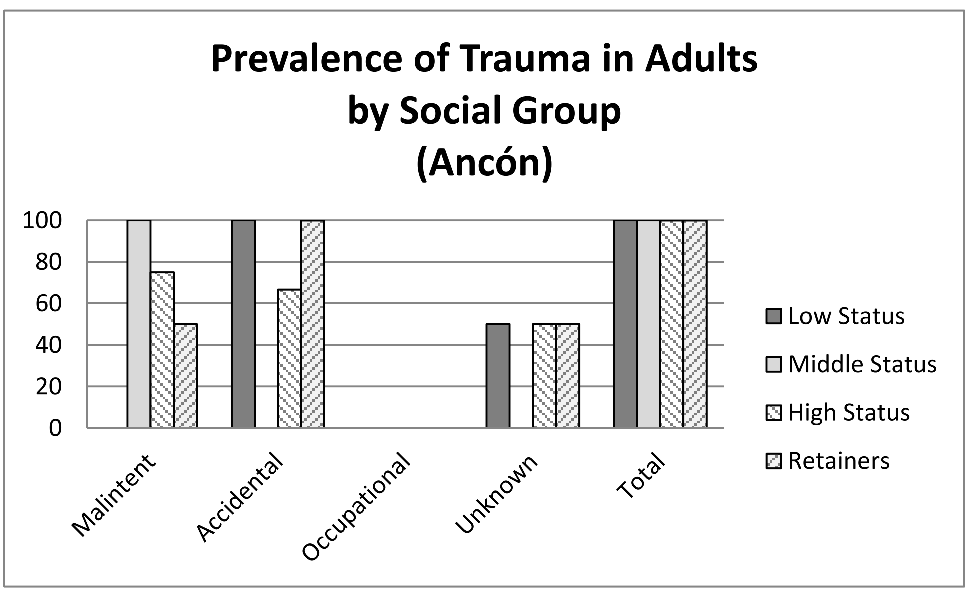

Figure 5.122: Prevalence of Trauma in Adults by Social Status at the Site of Ancón

5.6 Late Intermediate Period (Ychsma)

The Late Intermediate (Ychsma) Period sample is represented by one site, Armatambo ("22 de Octubre" sector), excavated between 2002 and 2003 by Díaz. Fifty skeletons (randomly selected to represent 20% of the recovered individuals) were analyzed by the author.

The sample exhibited a large number of young and middle adults (28%, n = 14 and 24%, n = 12), especially young males (18%, n = 9) and middle adult females (16%, n = 8). The number of infants was relatively low. Beside this, the overall sample followed the expected population distribution (see Chamberlain 2006; Séguy et al. 2008; and Wood et al. 2002) (Figure 5.123).

The rate of trauma in this population was very high: at least 80% (n = 4/5) of the adolescents, 93.8% (n = 15/16) of the adult females and 100% (n = 14/14) of the adult males presented at least one fracture. Only one female adolescent and one young female did not present any kind of trauma, albeit the loss of many hand and foot phalanges in these two individuals opens the possibility that they could have had lesions in these areas as well (Figures 5.124 and 5.125).

Accidents were the most plausible cause of the majority of these traumatic lesions (75-100% in adolescents and adults). However, malintent trauma was also high to very high in those age cohorts (~40-55%), as was the prevalence of unknown trauma among adults (~50-60%). Age seems to play a role in the prevalence of some traumas, since the prevalence was lower in the young adult cohorts. This was especially marked in trauma of unknown origin and occupational traumatic lesions among males (100% – n = 5/5 vs. 37.5% – n = 3/8, odds ratio = 17.29 – 95% CI 0.71-419.95; and 75% – n = 3/4 vs. 0% – n = 0/9, odds ratio = 44.33 – 95% CI 1.44-1365.15[95] respectively, when old and middle adult males were compared with young males). Thus, the prevalence of occupational trauma among middle and old adult males was significantly higher than in younger males

[95] Fisher's exact probability test: P=.01 (two-tailed)

(Figures 5.126 and 5.127). Both males and females presented similar high prevalences of foot fractures (100%, n = 8/8 vs. 77.8%, n = 7/9), followed by spinal fractures (~30-35%, especially L5 spondylolysis). There was no common location for this kind of trauma in subadults, which affected the limbs and the hands (Figures 5.128 to 5.132).

There was no clear difference between the prevalence of malintent trauma in adults and adolescents. However, a slight tendency for males to have more malintent fractures was detected. Although there were no cases of malintent trauma in infants and children, more than one half of these individuals (9 out of 15) presented incomplete skulls (Figure 5.133). The most common location for this kind of trauma in adults was the facial area (28.6%, n = 4/14 in males and 18.8%, n = 3/16 in females), with no clear pattern for the adolescents (Figures 5.134 to 5.137).

Contrasting with what was found in prior periods, fatal trauma was almost as common as low lethality wounds in adolescents and adults (~20-35%), and they were found in four middle adult females (frontal, T11, left scapular body, and ribs), two young and one old males (ribs), and one male adolescent of 15-17 years (skull and right scapular body). All of these lesions were caused by blunt force (Figures 5.138 to 5.144).

The MNEv was predominantly 1 among individuals aged 12 years and older (~60-80%). There were many cases of repetitive trauma, with 25% (n = 4/16) of the adult females and 21.4% (n = 3/14) of the adult males presenting lesions of two different stages of healing (Figure 5.145). An old male and a middle adult female had lesions in four different stages of healing (representing at least four different events of trauma), especially in the thoracic region (Figures 5.146 to 5.149).

Most of the individuals were catalogued as “high status” (40%, n = 20), followed by low status individuals (34%, n = 17). Males tended to be assigned to the two highest status groups of this population (Figure 5.150). The three social segments demonstrated similar prevalence of general trauma in adults. However, there was a tendency for high status adults to present a higher prevalence of occupational fractures (27.3% – n = 3/11 vs. 12.5% – n = 2/16, odds ratio = 2.63 – 95% CI 0.36-19.18 when they were compared with the other two status groups). Although the prevalence of malintent trauma was similar between low status adults and the other two groups combined (55.6%, n = 5/9 vs. 40%, n = 8/20), the prevalence of lethal wounds was higher in low status adults (44.4%, n = 4/9 vs. 15%, n = 3/20, odds ratio = 4.53 – 95% CI 0.75-27.39) (Figure 4.151).

In summary, as was seen in the prior time period, almost every adolescent and adult presented at least one fracture. Accidental trauma was very common (especially on the feet). However, unknown and malintent fractures also affected around half of the individuals aged 12 years and older.

Prevalence of malintent trauma was slightly higher in males (53.8%, n = 7/13) than in females (37.5%, n = 6/16), but the difference was not as pronounced as it was during the Middle Horizon 3-4. A difference in the location of malintent fractures by sex could not be found either, as the majority of the lesions were located in the facial area for both males and females, similar to the males of Ancón.

The cases of fatal and repetitive trauma were more common than in the previous time period. The MNEv was predominantly 1 among individuals aged 12 years and older (~60-80%), but there were many cases of repetitive trauma (20-25%), especially in the thoracic region. The prevalence of lethal fractures was higher among low status individuals.

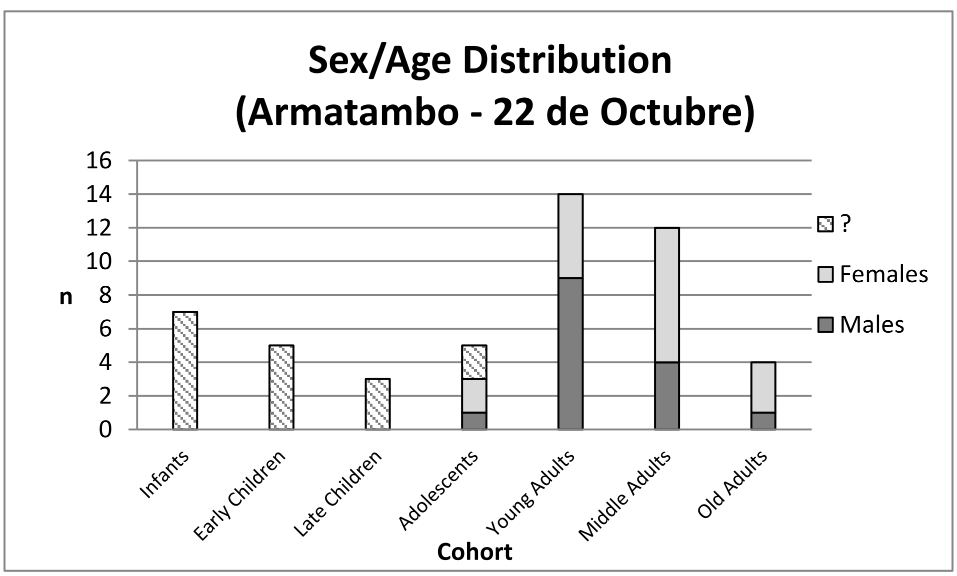

Figure 5.123: Sex and Age Distribution at the Site of Armatambo (22 de Octubre)

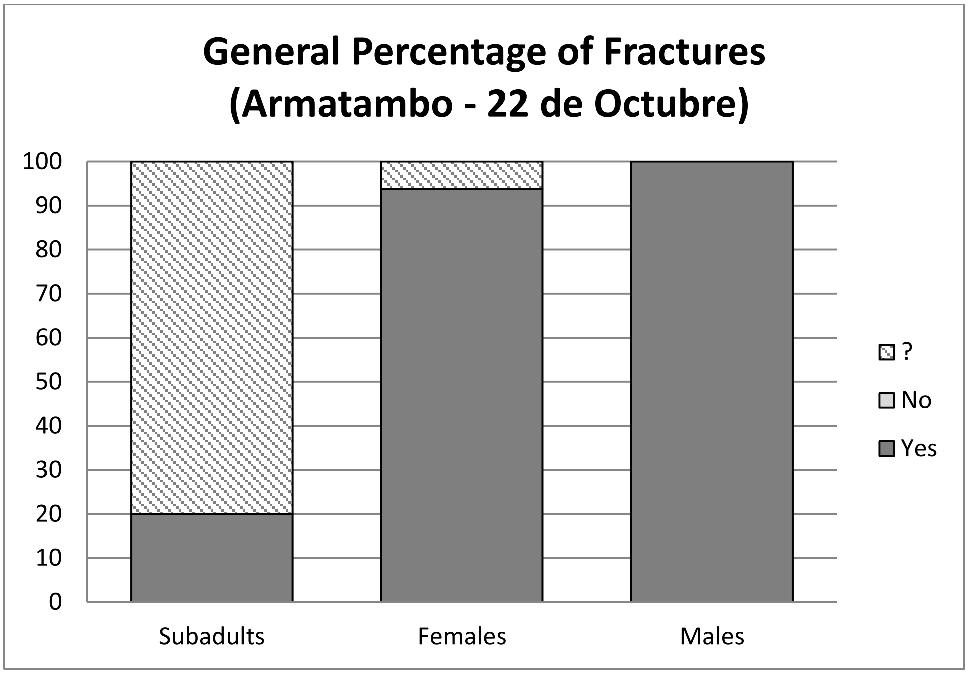

Figure 5.124: General Percentage of Fractures in Subadults, Females, and Males from Armatambo (22 de Octubre)

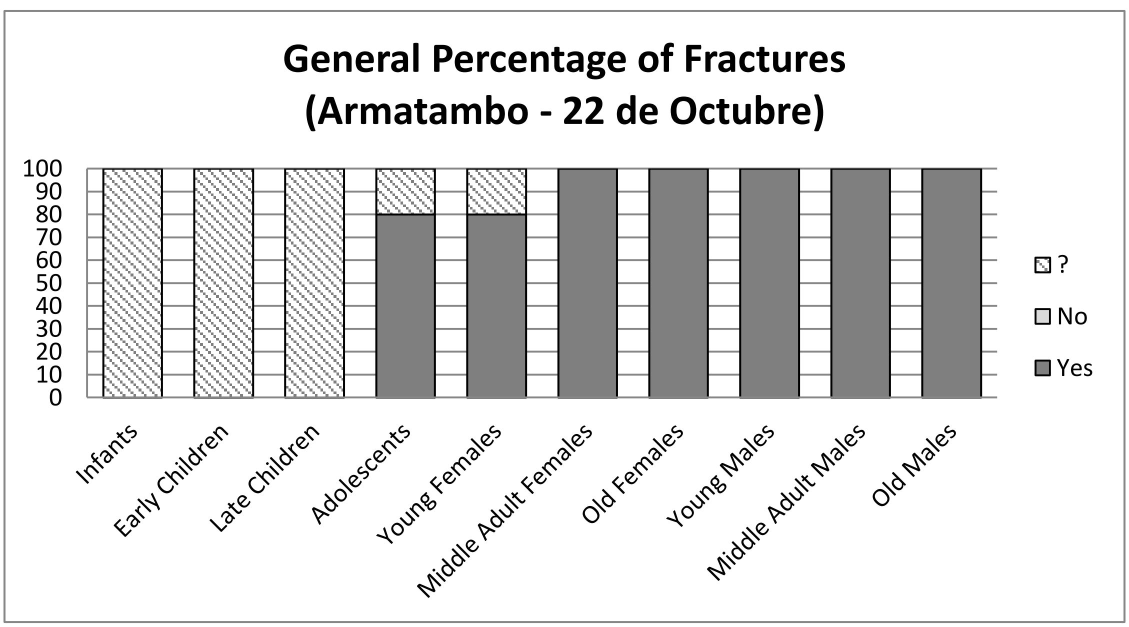

Figure 5.125: General Percentage of Fractures by Age Cohort at the Site of Armatambo (22 de Octubre)

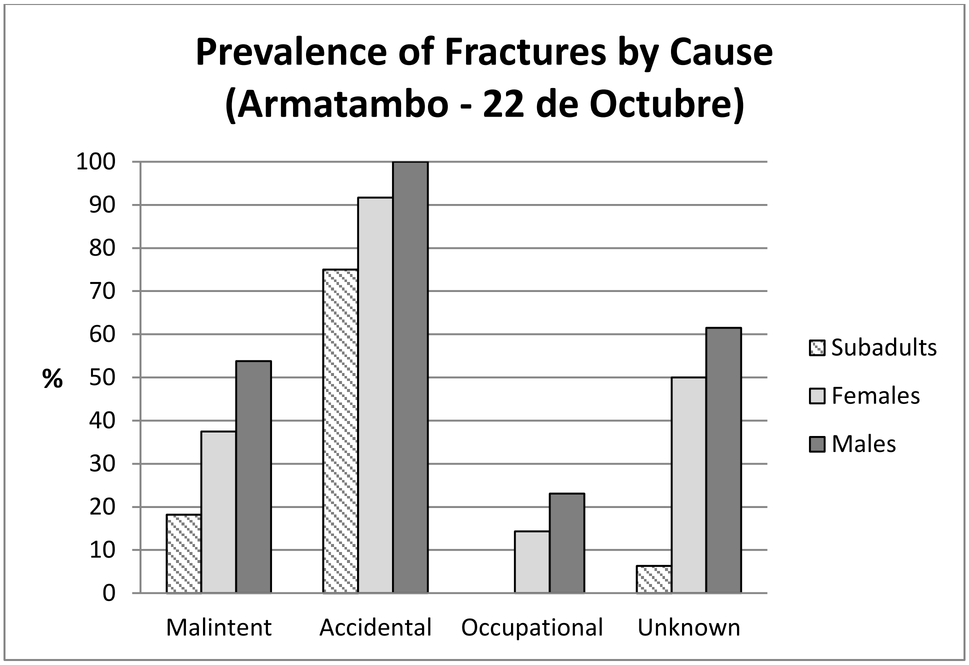

Figure 5.126: Prevalence of Fractures by Most Probable Cause at the Site of Armatambo (22 de Octubre)

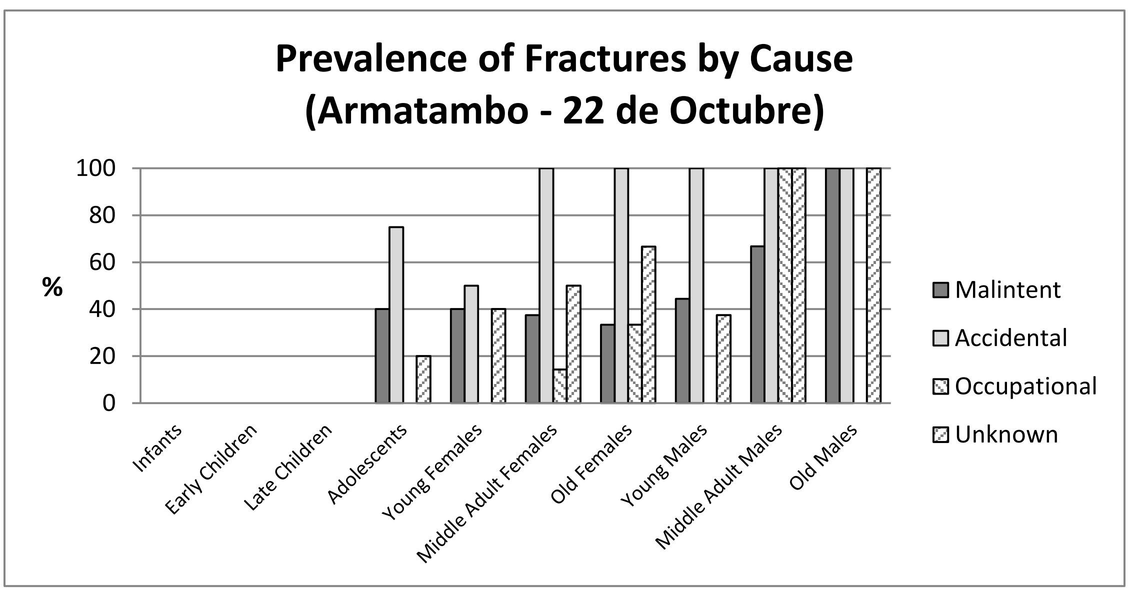

Figure 5.127: Most Probable Cause of Fractures by Age Cohort at the Site of Armatambo (22 de Octubre)

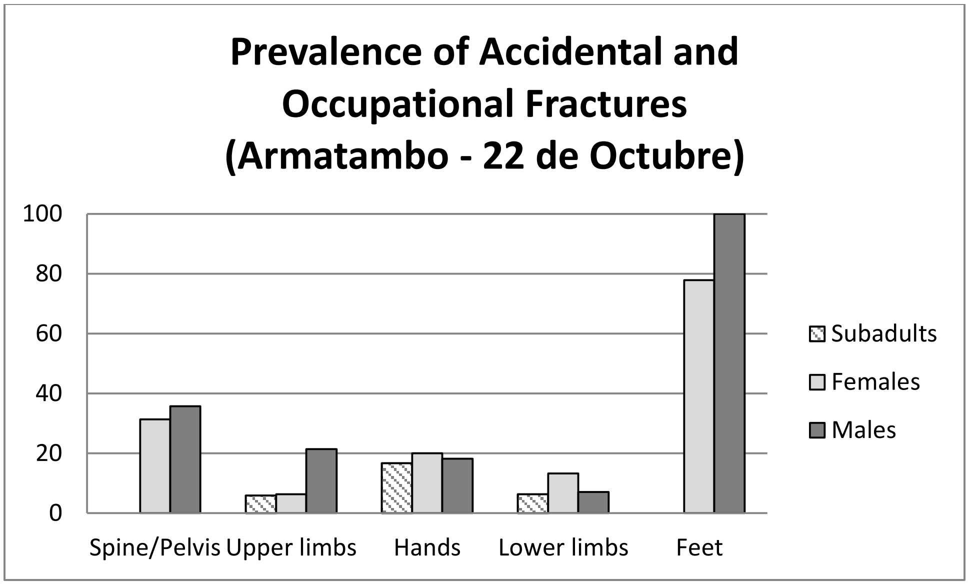

Figure 5.128: Prevalence of Accidental and Occupational Fractures by Location at the Site of Armatambo (22 de Octubre)

Figure 5.129: Healed Fracture on the Proximal Articular Facet of the 5th Proximal Phalange of the Right Foot (Armatambo-22 de Octubre, CF 94, Middle Adult Female)

Figure 5.130: Spondylolysis of L5

(Armatambo-22 de Octubre, CF 10A, Middle Adult Male)

Figure 5.131: Healed Fracture of the Left Femur

(Armatambo-22 de Octubre, CF 166, Adolescent)

Figure 5.132: Close-up View of the Last Lesion. Note the Bone Fragment Surrounded by Sclerotic and Woven Reaction, and the Formation of Three Large Cloacae

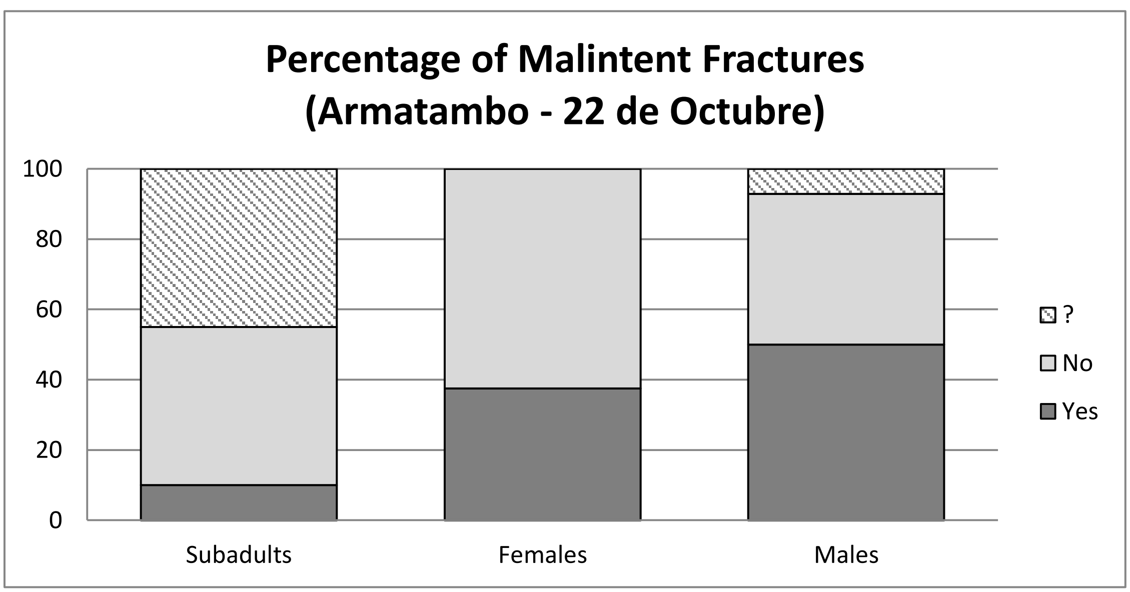

Figure 5.133: Percentage of Malintent Fractures at the Site of Armatambo (22 de Octubre)

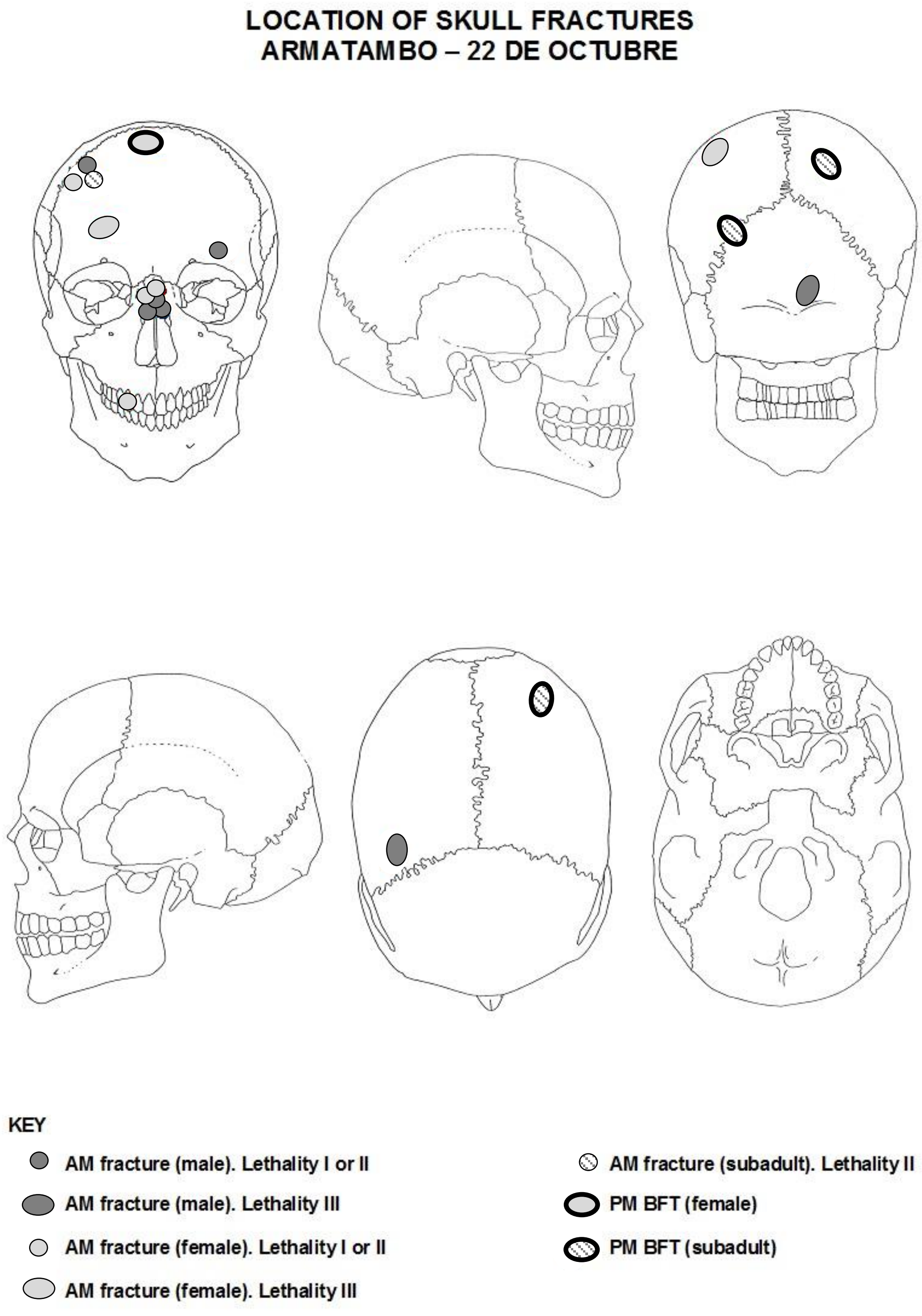

Figure 5.134: Location of Skull Fractures at the Site of Armatambo (22 de Octubre) Based on Fifteen Individuals. Skull Sketches after Buikstra and Ubelaker (1994)

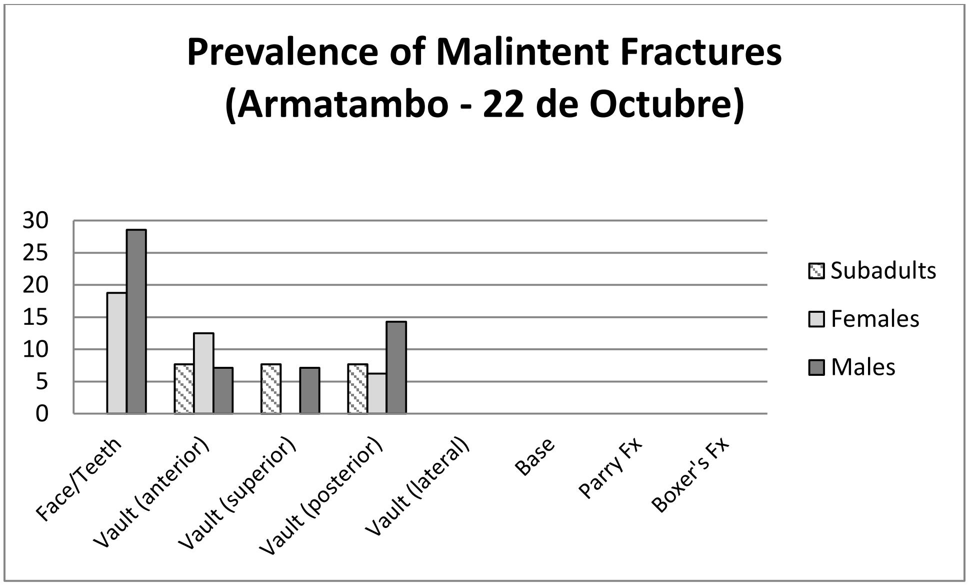

Figure 5.135: Prevalence of Malintent Fractures by Location/Type at the Site of Armatambo (22 de Octubre)

Figure 5.136: Healed Fracture on the Right Nasal Bone (Armatambo-22 de Octubre, CF 101A, Young Male)

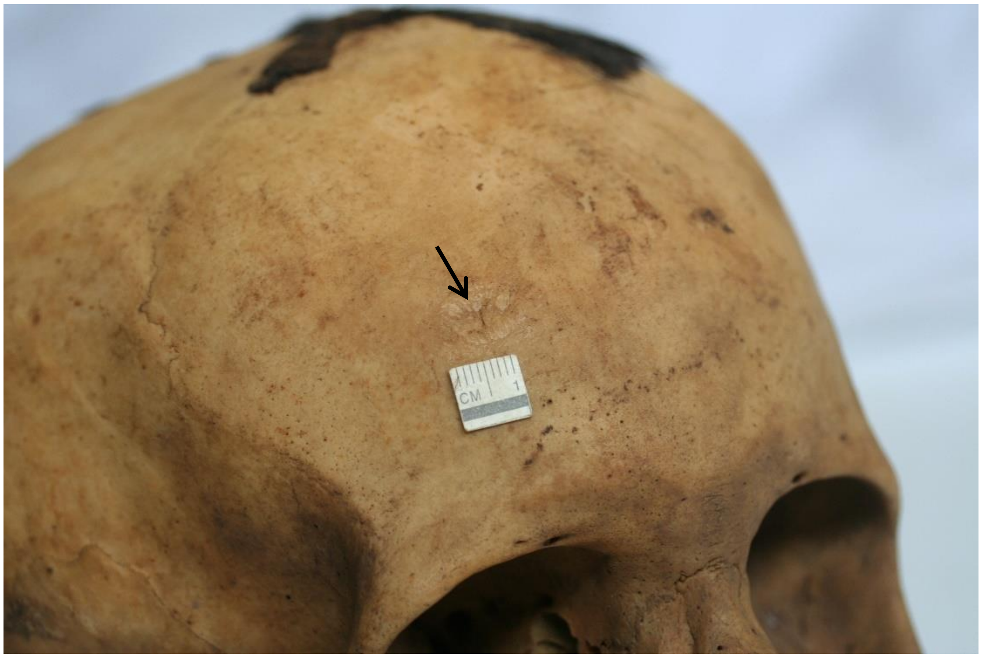

Figure 5.137: Healed Fracture on the Right Side of the Frontal (Facial Area) (Armatambo-22 de Octubre, CF 106, Middle Adult Female)

Figure 5.138: Perimortem Fracture (BFT) to the Upper Aspect of the Frontal (Armatambo-22 de Octubre, CF 20, Middle Adult Female). Photo by Franco Mora

Figure 5.139: Close-up View of the Last Lesion

Figure 5.140: Perimortem Fracture (BFT) to the Posterior and Upper Aspect of the Skull (Armatambo-22 de Octubre, CF 150, Male Adolescent). Photo by Franco Mora

Figure 5.141: Close-up View of One the Last Lesions. Photo by Franco Mora

Figure 5.142: Perimortem Fracture (BFT) to the Left Scapula (Armatambo-22 de Octubre, CF 106, Middle Adult Female)

Figure 5.143: Perimortem Fracture (BFT) of the Right 7th Rib (Sternal End) (Armatambo-22 de Octubre, CF 13, Young Male). Photo by Franco Mora

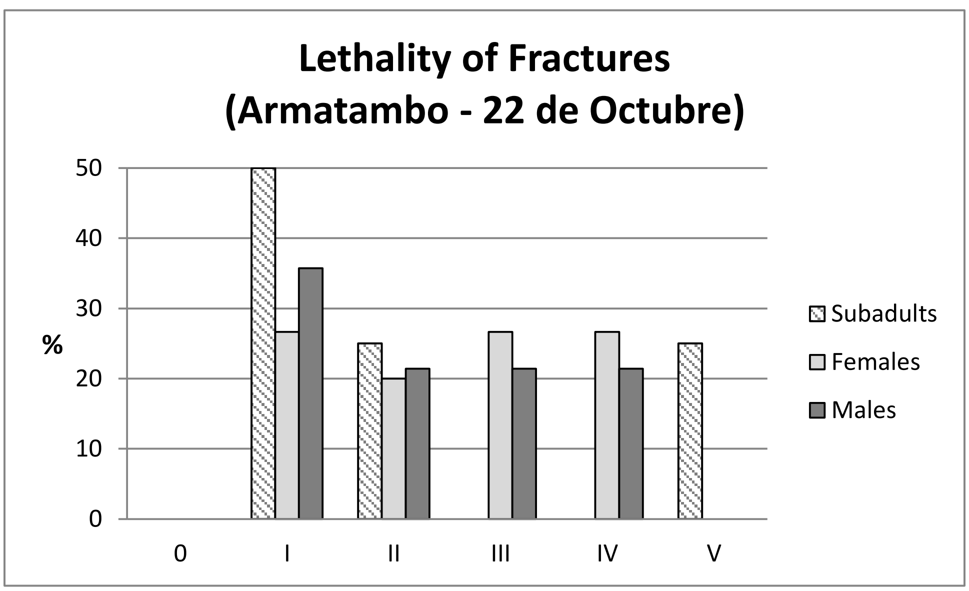

Figure 5.144: Prevalence of Fractures by Lethality at the Site of Armatambo (22 de Octubre)

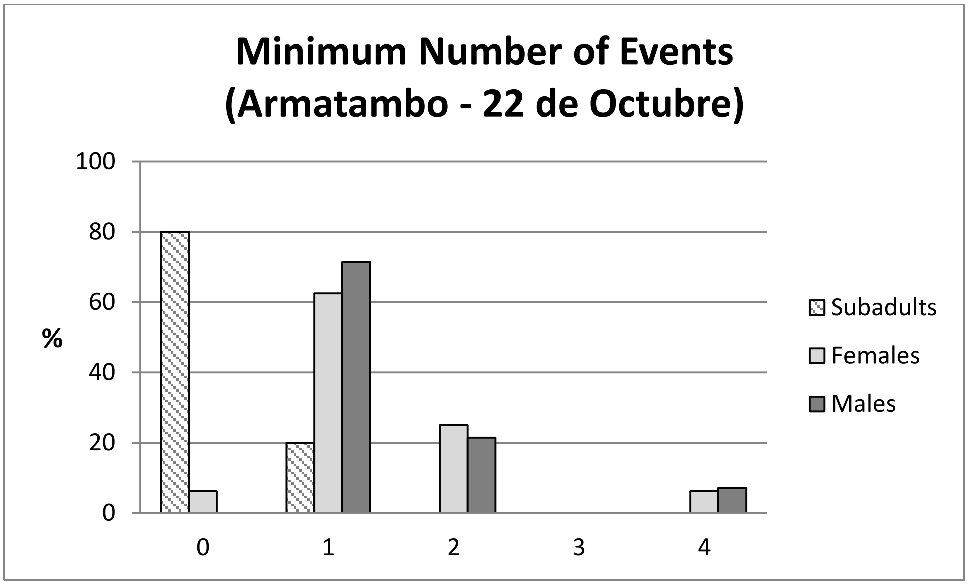

Figure 5.145: Minimum Number of Events at the Site of Armatambo (22 de Octubre)

Figure 5.146: Healed Fracture on the Sternal End of the Right 7th Rib (Armatambo-22 de Octubre, CF 103, Old Male)

Figure 5.147: Open Fracture with Moderate Bone Proliferation on the Sternal End of the Right 5th Rib (Armatambo-22 de Octubre, CF 103, Old Male)

Figure 5.148: Antemortem Fracture (Close to the Death) with Smooth Edges and Little Reactive Bone Formation on the Sternal Third of the Left 8th Rib (Armatambo-22 de Octubre, CF 103, Old Male)

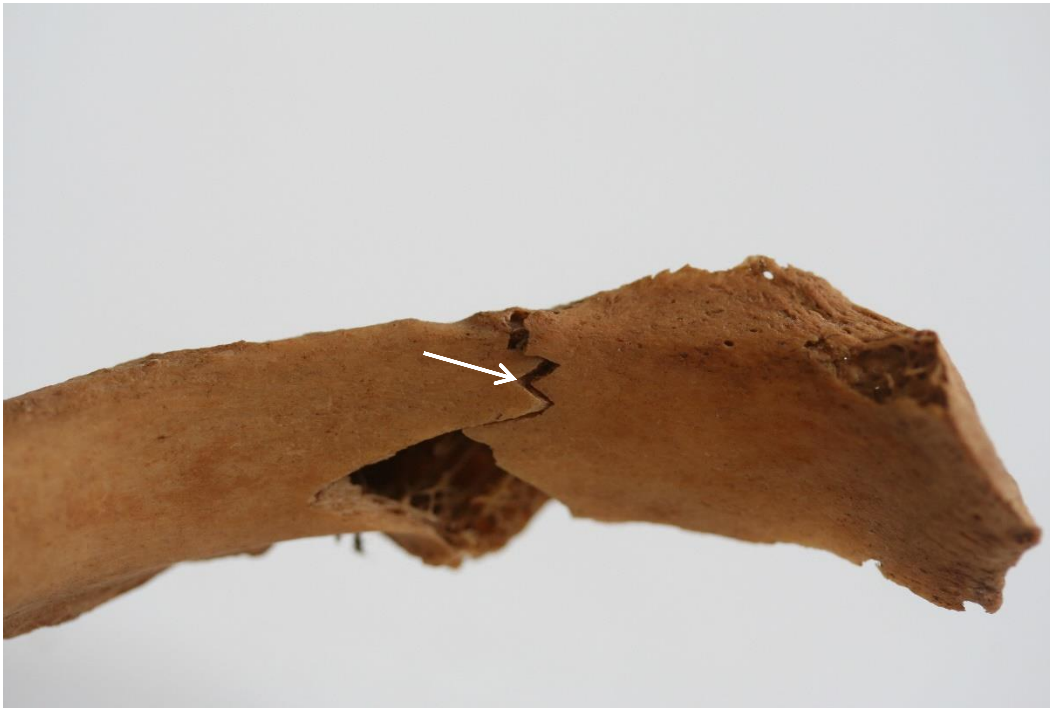

Figure 5.149: Perimortem Fracture on the Neck of the Right 7th Rib (Armatambo-22 de Octubre, CF 103, Old Male)

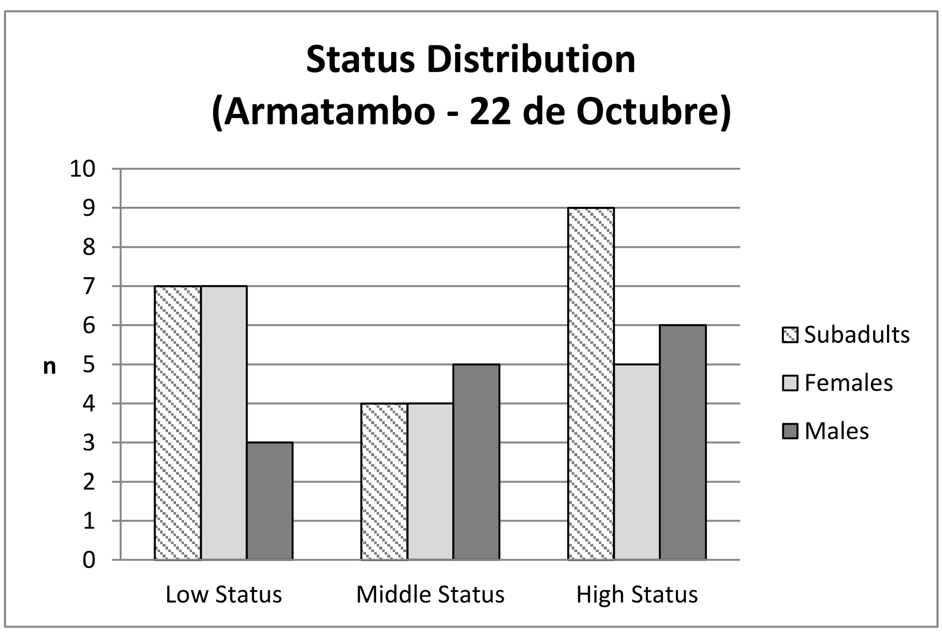

Figure 5.150: Status Distribution at the Site of Armatambo (22 de Octubre)

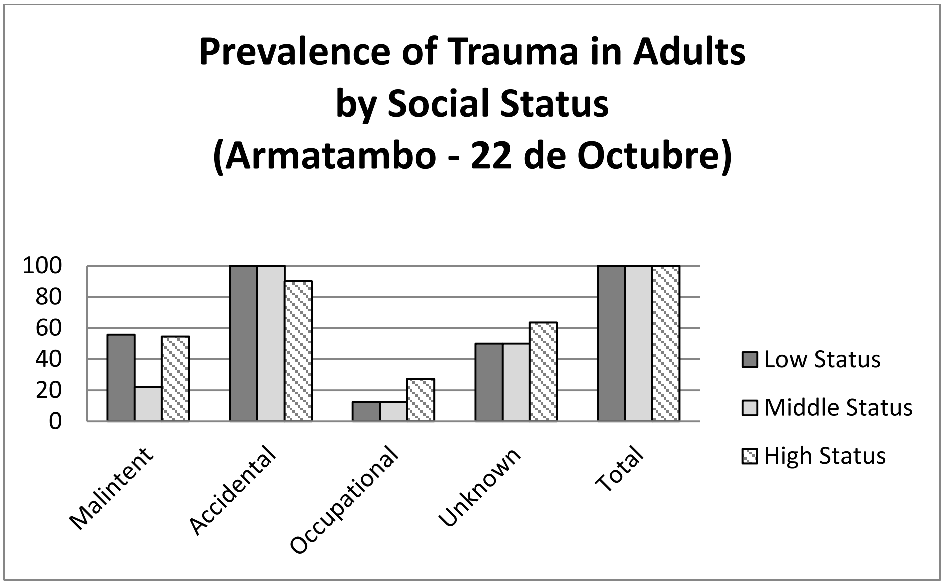

Figure 5.151: Prevalence of Trauma in Adults by Social Status at the Site of Armatambo (22 de Octubre)

5.7 Late Horizon Period

Two Late Horizon samples were analyzed for this study: Pueblo Viejo-Pucará and Puruchuco (57AS03). The Pueblo Viejo-Pucará sample consists of 107 skeletons, recovered in three different sectors of the site: Sector II (herders area), Sector III (domestic unit), and Sector IV (military area), excavated during the 2000s by undergraduate and graduate students under Makowski's supervision. The other sample comes from the 57AS03 cemetery of Puruchuco (excavated by Cock and his team in 2004 and 2006) and includes 80 individuals. While the first sample was analyzed by the author, the second is a reinterpretation of published and unpublished osteological data generated by Murphy, Gaither, and Lund. The results of both samples are presented separately, as their size allowed comparisons to be made between sites.

The sites showed different demographic compositions. Pueblo Viejo-Pucará presented a large number of young adults (28%, n = 30) and early children (26.2%, n = 28) (Figure 5.152); while Puruchuco (57AS03) had a large presence of middle adults (41.3%, n = 33), especially of males (25%, n = 25). Adult males were more numerous than adult females in Puruchuco (n = 28 vs. n = 25), contrary to Pueblo Viejo-Pucará (n = 24 vs. n = 29). In contrast to the expectations for this kind of society (see Chamberlain 2006; Séguy et al. 2008; Wood et al. 2002), infants and children only represented one quarter of the Puruchuco sample (Figure 5.153).

At least 51.7% (n = 15/29) of the females, 41.7% (n = 10/24) of the males, and 5.6% (n = 3/54) of the subadults from Pueblo Viejo-Pucará presented some kind of trauma, affecting especially middle and old adult females (Figures 5.154 and 5.155). However, the large number of individuals with missing or incomplete osteological elements (especially ribs and foot and hand bones) could be affecting these rates.

Gaither and Murphy and Lund used different methods for recording and reporting traumatic lesions (specifically with regard to antemortem trauma on adults) at Puruchuco (57AS03), which means that we must be careful with regard to our interpretation of their data. However, Gaither and Murphy's (2012) more complete data let us infer that at least 25.9%, n = 7/27 (36.8%, n = 7/19 of prevalence) of the subadults from this site presented traumatic lesions. This is in contrast to the prior time period, in which no individual younger than 13 years was affected. In the 57AS03 cemetery, the cases of trauma in subadults included both adolescents and children (Figures 5.156 and 5.157). The prevalence of trauma in children (30%, n = 3/10) was the highest for this age cohort of our complete central coast sample.

In Pueblo Viejo-Pucará, accidental fractures were the most common type of trauma among females (75%, n = 3/4) and unknown trauma was most common in males (40%, n = 2/5) and subadults (11.1%, n = 1/9). Again, the small number of observable cases could be affecting these results (Figures 5.158 and 5.159). For this same reason, the most common location for accidental and occupational traumatic lesions in Pueblo Viejo-Pucará could not be established.

The most common kind of trauma in Puruchuco subadults was malintent (16.7%, n = 4/24), similar to the prevalence found in the previous time period (Figures 5.160 and 5.161). Pueblo Viejo-Pucará adults showed similar prevalences of malintent trauma (39.1%, n = 9/23 in females and 34.8%, n = 8/23 in males), contrasting with the 3.8% (n = 1/26) found in subadults. Although the information about antemortem trauma in

Puruchuco adults was limited, it was noticed that the prevalence of malintent perimortem trauma in adults was similar (8%, n = 2/25 in females and 7.1%, n = 2/28 in males), and the prevalence of malintent trauma (both antemortem and perimortem) in subadults was higher than in Pueblo Viejo-Pucará (16.7% – n = 4/24 vs. 3.8% – n = 1/26, odds ratio = 5 – 95% CI 0.52-48.34). Moreover, the age distribution of this kind of lesion in the subadult group was also different: an early child in Pueblo Viejo-Pucará and one late child and three adolescents (one of them, a male) in Puruchuco. Nonetheless, the high percentage of subadult individuals of Pueblo Viejo-Pucará with postmortem damage in the skull (especially in the facial area) could be hiding some cases of malintent trauma (Figures 5.162 and 5.163).

Malintent trauma in adults from Pueblo Viejo-Pucará predominately affected the facial area in females (16%, n = 4/25) and the back of the skull in males (13%, n = 3/23). The only case of malintent trauma in subadults was located in the superior aspect of the skull (Figures 5.164 to 5.168). In the case of Puruchuco, malintent traumatic lesions in males were not concentrated in a single area, contrary to females, whose injuries were exclusively found in the facial zone. However, the difference between the prevalence of facial fractures in females (40%, n = 2/5) and males (25%, n = 2/8), was not statistically significant (odds ratio = 2 – 95% CI 0.18-22.06). Malintent trauma was located in the anterior and posterior part of the skull and in the ulna in the case of subadults (Figures 5.169 and 5.170).

Fatal wounds in Pueblo Viejo-Pucará were rare, with only one female (6.7%, n = 1/13) with a blunt force traumatic lesion in the posterior part of the right parietal; and two males, one with a blunt force traumatic lesion in the upper-right part of the frontal and the other with a sharp-blunt traumatic lesion in the base of the occipital (20%, n = 2/10) (Figures 5.171 to 5.173). The prevalence of fatal wounds in Puruchuco was slightly higher than in Pueblo Viejo-Pucará, with three subadults (15.8%, n = 3/19), two females (8%, n = 2/25), and three males (10.7%, n = 3/28) presenting at least one blunt force or sharp-force trauma lesion. Adults demonstrated a large number of cases with the highest lethality (V) (Figures 5.174 to 5.178). When only malintent perimortem traumatic lesions were observed, the prevalence was 0% (n = 0/26) in subadults, 4.3% (n = 1/23) in females, and 8.7% (n = 2/23) in males from Pueblo Viejo-Pucará; and 8.3% (n = 2/24) in subadults, 8% (n = 2/25) in females, and 7.1% (n = 2/28) in males from Puruchuco. The difference between sites was not statistically significant. The MNEv was predominantly 0 in Pueblo Viejo-Pucará, with only two cases of repetitive trauma (Figure 5.179). The few data collected for Puruchuco about antemortem trauma did not allow us to reach a definitive conclusion about this point. However, a MNEv of 2 was detected in at least four individuals (two males and two subadults).

The majority of the individuals from Pueblo Viejo-Pucará come from the "Pucará" section of the complex (57%, n = 61), where the military dwellings were sited. The objects found in this complex indicated that the people who lived there enjoyed high status. The rest of the sample was classified as middle status individuals and came from the herders area (15.9%, n = 17) and the conglomerate domestic settlement (23.4%, n = 25) of the Pueblo Viejo section. Both status groups had the same proportion of subadults to adults. Four individuals (3.7%) – one perinate and a young female from the herders' area, and one perinatal and one early child from the military dwellings – could have been sacrificed during the construction and remodeling of the architecture (Figure 5.180). The presence of malintent and unknown trauma was greater in adults from the military area (44% – n = 11/25 vs. 30% – n = 6/20 in malintent trauma, odds ratio = 1.83 – 95% CI 0.53-6.34; and 80% – n = 4/5 vs. 37.5% – n = 3/8 in unknown trauma, odds ratio = 6.67 – 95% CI 0.49-91.33) (Figure 5.181). The difference was more evident when individuals of the same sex were compared. While females of both social statuses presented similar prevalences of malintent and unknown trauma (~40% and ~60-70% respectively), males of the military sector had higher prevalences of both kinds of trauma than the males of the other two sectors (50% – n = 6/12 vs. 18.2% – n = 2/11 in malintent trauma, odds ratio = 4.5 – 95% CI 0.67-30.23; and 100% – n = 2/2 vs. 0% – n = 0/3 in rib fractures, odds ratio = 35 – 95% CI 0.50-2435.88). All the cases of malintent perimortem trauma were also from the military sector. None of the four possible human sacrifices presented signs of trauma.

In Puruchuco, most individuals were assigned to the "middle status" group (58.8%, n = 47), followed by the "low status" group (38.8%, n = 31). In the latter the number of subadults was greater than the adults (Figure 5.182). Many of the male individuals in Puruchuco were identified as soldiers, while most of the females were classified as weavers based on the associated grave goods. Most of the trauma in adults was found among low status individuals, especially perimortem fractures in the skull and ribs (Figure 5.183). The prevalence of perimortem malintent trauma was 21.4% (n = 3/14) in low status adults and 2.6% (n = 1/38) in middle status adults (odds ratio = 10.09 – 95% CI 0.95-107)[96]; while the prevalence of perimortem unknown trauma was 28.6% (n = 4/14) in low status adults and 0% (n = 0/38) in middle status adults (<u>odds ratio = 29.57 – 95% CI 1.47-595.36</u>)[97], affecting slightly more males (n = 3/7) than females (n = 1/7). These results show that the prevalence of perimortem trauma on the ribs/sternum was significantly higher in low status adults than in middle status adults. When only adolescents and adult males were compared, there was a difference in the prevalence of perimortem malintent and unknown trauma of "soldiers" (27.3%, n = 3/11 and 18.2%, n = 2/11) and "non-soldiers" (4.2%, n = 1/24 and 4.5%, n = 1/22) (odds ratio = 8.63 – 95% CI 0.78-95.26 and odds ratio = 4.67 – 95% CI 0.37-58.25 respectively).

In summary, in Pueblo Viejo-Pucará, trauma was present in at least ~40-50% of the adults, with accidental fractures in females and unknown fractures in males being the most common types of trauma. However, the number of missing skeletal elements could be affecting these results. Males and females from this site showed similar prevalences of malintent trauma (34.8%, n = 8/23 and 39.1%, n = 9/23 respectively). Nonetheless, the location of these lesions was different: mostly the facial area in females and the back of the skull in males. The prevalence and location of malintent trauma in females was similar to the Ychsma site of Armatambo, contrary to the male cases (50% and commonly located on in the face in Armatambo males). Fatal injuries and repetitive trauma were rare, contrasting with what was found in the previous time period. The presence of malintent and unknown trauma was greater in the military area of the site,

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[96] Fisher's exact probability test: P=.0547 (two-tailed)

[97] Fisher's exact probability test: P=.004 (two-tailed)

especially in males. Females of the two social statuses had similar prevalences of these two trauma types.

Although the incomplete available data regarding antemortem trauma in adults from Puruchuco limited our interpretations of the site, some interesting information could be rescued: The prevalence of general trauma in children (30%, n = 3/10) was the highest so far for this age cohort. The prevalence of malintent perimortem trauma in adults of different sexes was similar (8%, n = 2/25 in females and 7.1%, n = 2/28 in males). The lesions in males were not concentrated in one single area, while fractures in females were found in the facial zone exclusively. The prevalence of fatal wounds in Puruchuco was slightly higher than in Pueblo Viejo-Pucará (especially in malintent trauma in subadults), with adults demonstrating a great number of cases with the highest lethality. Trauma in adults from Puruchuco (especially perimortem fractures in the skull and ribs) was significantly higher in low status individuals, as it was in the Ychsma site of Armatambo. Adolescents and adult males identified as soldiers exhibited higher prevalence of perimortem malintent and unknown trauma than "non-soldiers" of the same age and sex cohorts.

The comparison between Pueblo Viejo-Pucará and Puruchuco (57AS03) was difficult due to the limitations of the available data. Despite that, some similarities and differences were detected. In this way, it was noticed that in both Late Horizon samples, there were no major sex differences in the prevalence of malintent trauma, contrary to what was found in the sample from the earliest time period in which the malintent trauma in males was slightly more common. Nonetheless, malintent trauma (at least the fatal kind) was more common among adult males related to military activities at both Inca sites. Similarly, malintent lesions in females from this time period were concentrated in the facial area, as was found in the Ychsma site of Armatambo. On the other hand, the number of individuals with fatal wounds was similar in Puruchuco and Armatambo, which was greater than in individuals from Pueblo Viejo-Pucará. However, highly lethal injuries were more common in Puruchuco.

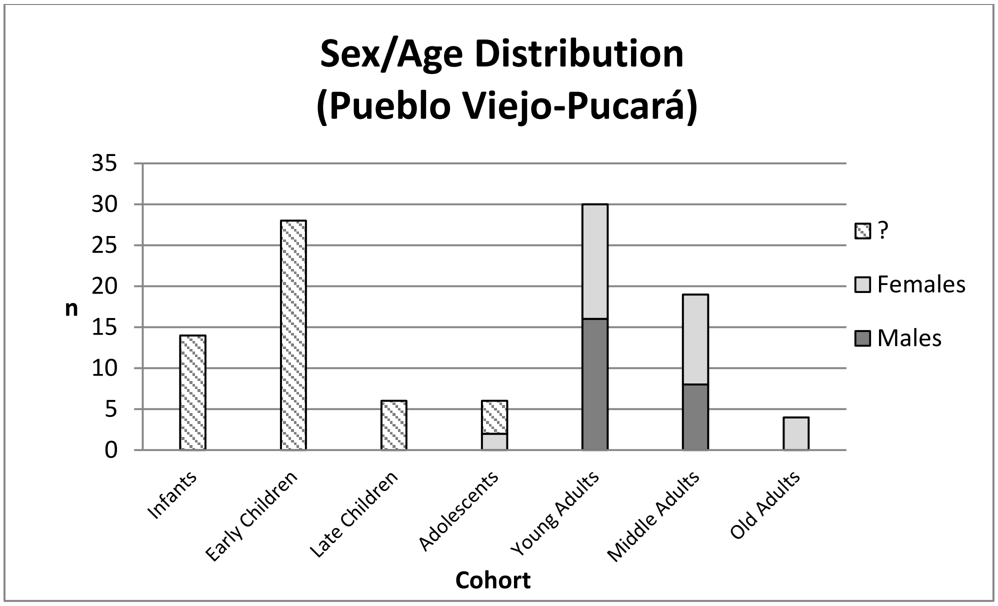

Figure 5.152: Sex and Age Distribution at the Site of Pueblo Viejo-Pucará

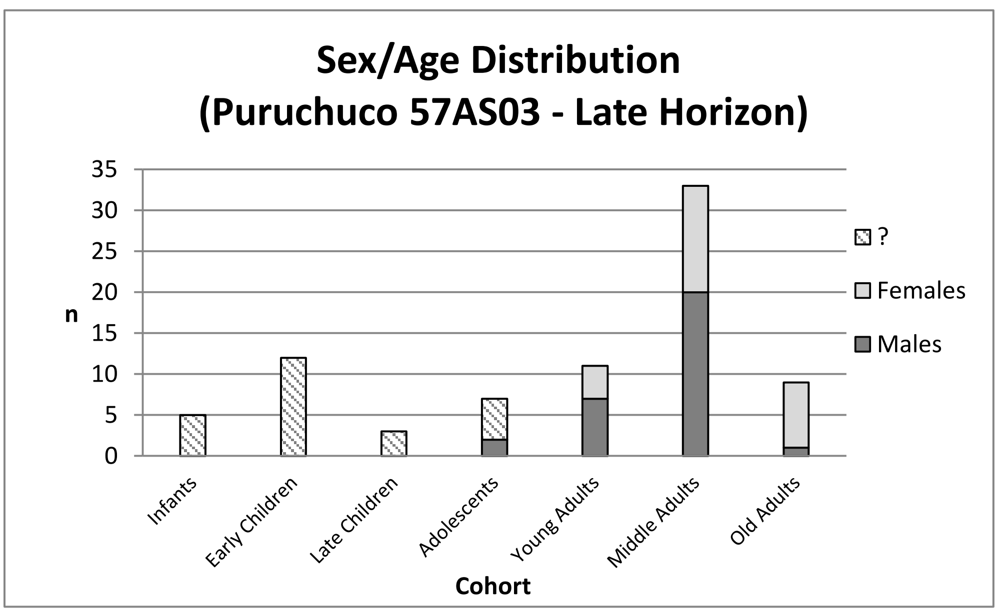

Figure 5.153: Sex and Age Distribution at the Site of Puruchuco-57AS03 (Late Horizon)

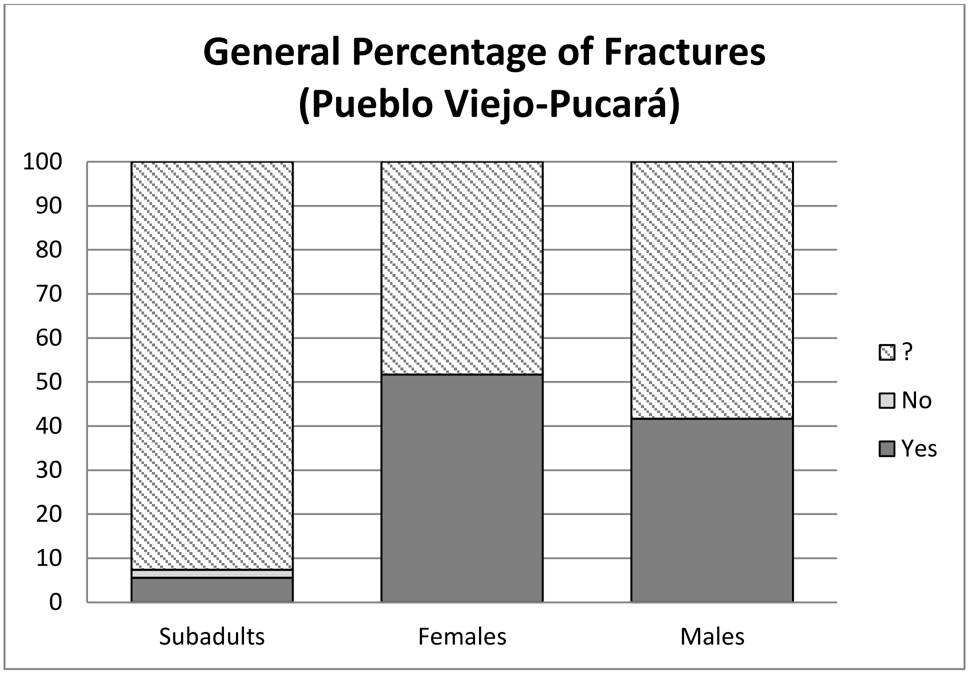

Figure 5.154: General Percentage of Fractures in Subadults, Females, and Males from Pueblo Viejo-Pucará

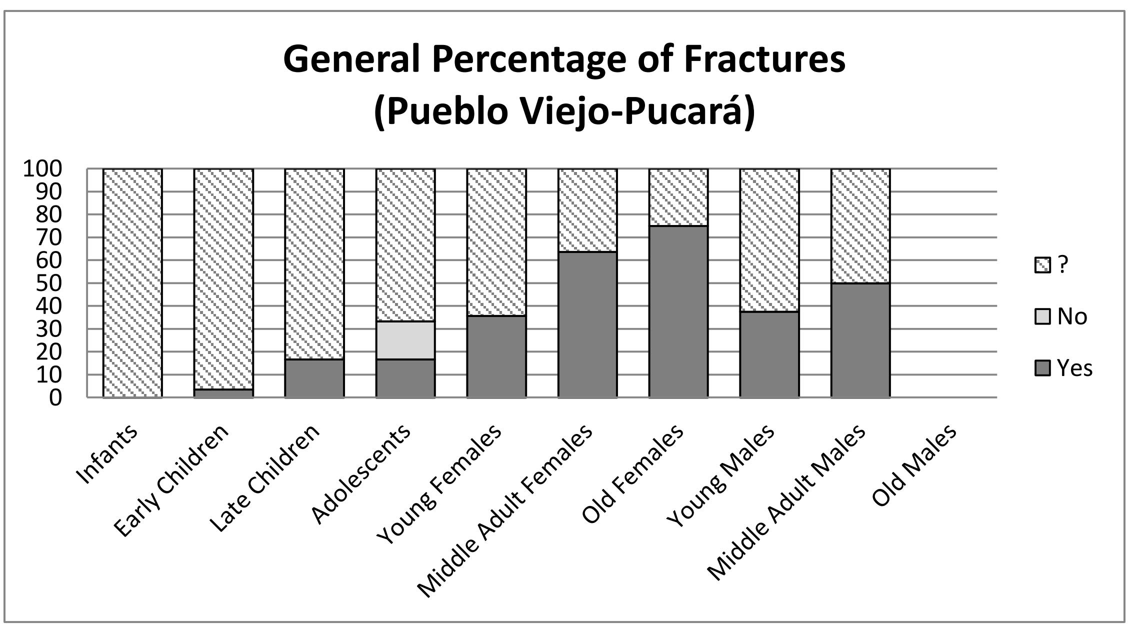

Figure 5.155: General Percentage of Fractures by Age Cohort at the Site of Pueblo Viejo-Pucará

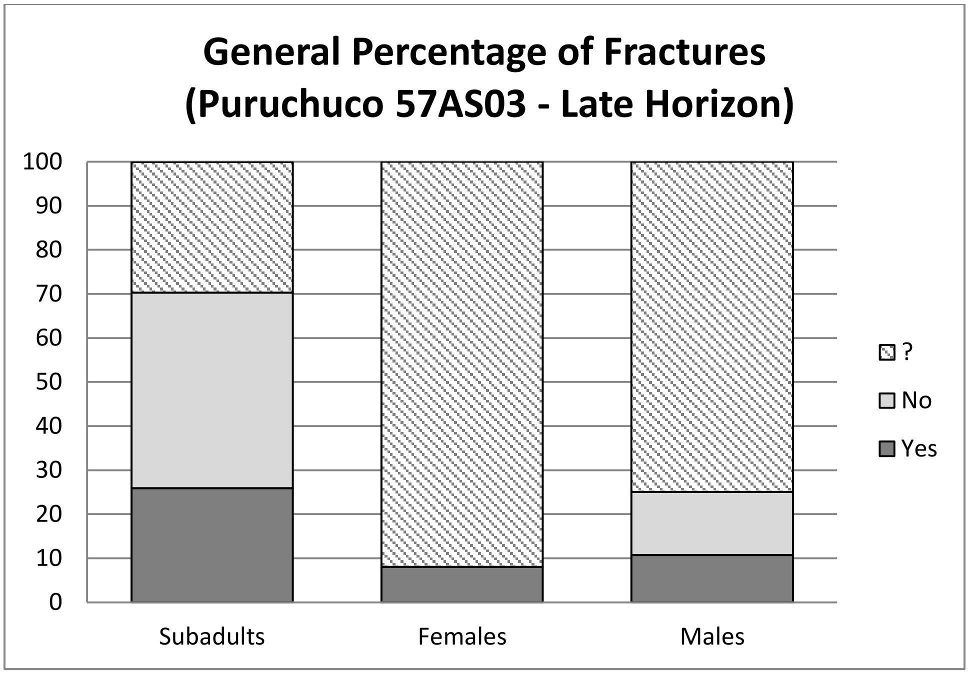

Figure 5.156: General Percentage of Fractures in Subadults, Females, and Males from Puruchuco-57AS03 (Late Horizon)

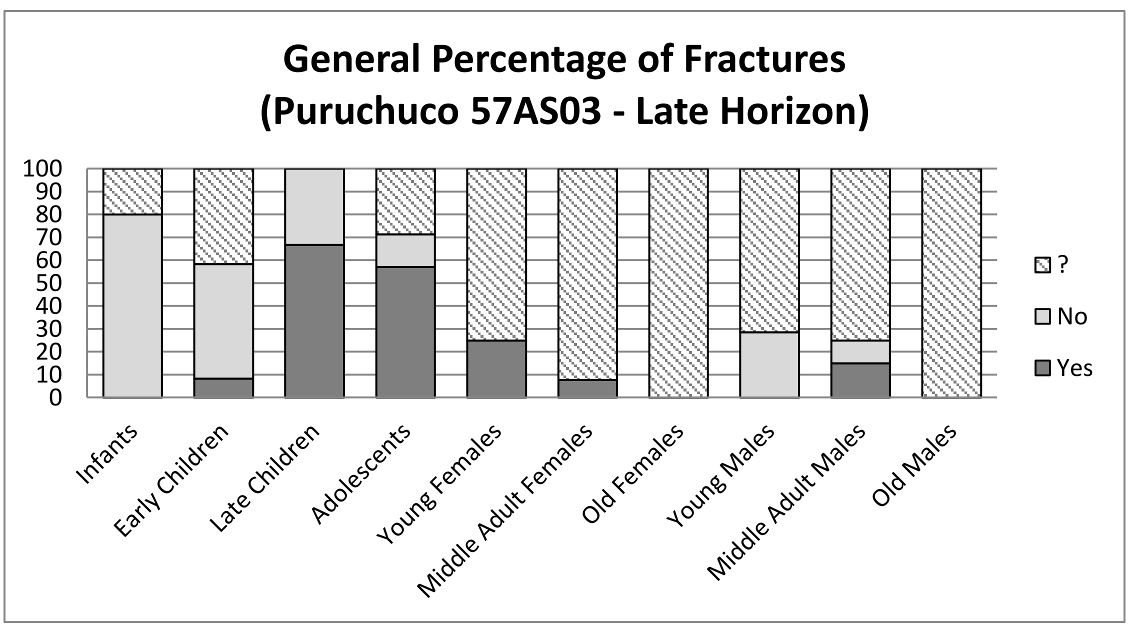

Figure 5.157: General Percentage of Fractures by Age Cohort at the Site of Puruchuco-57AS03 (Late Horizon)

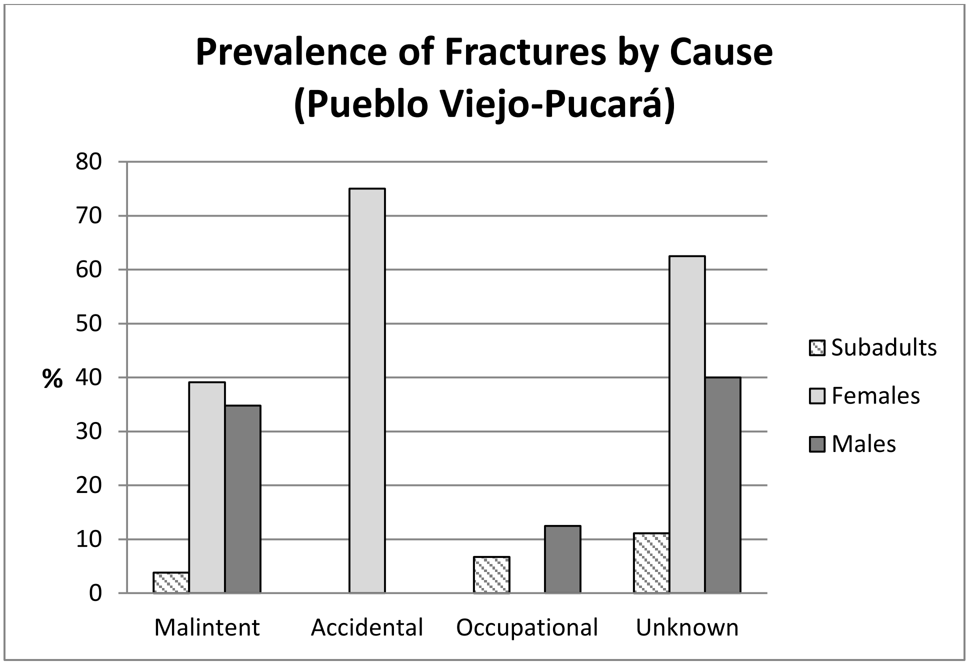

Figure 5.158: Prevalence of Fractures by Most Probable Cause at the Site of Pueblo Viejo-Pucará

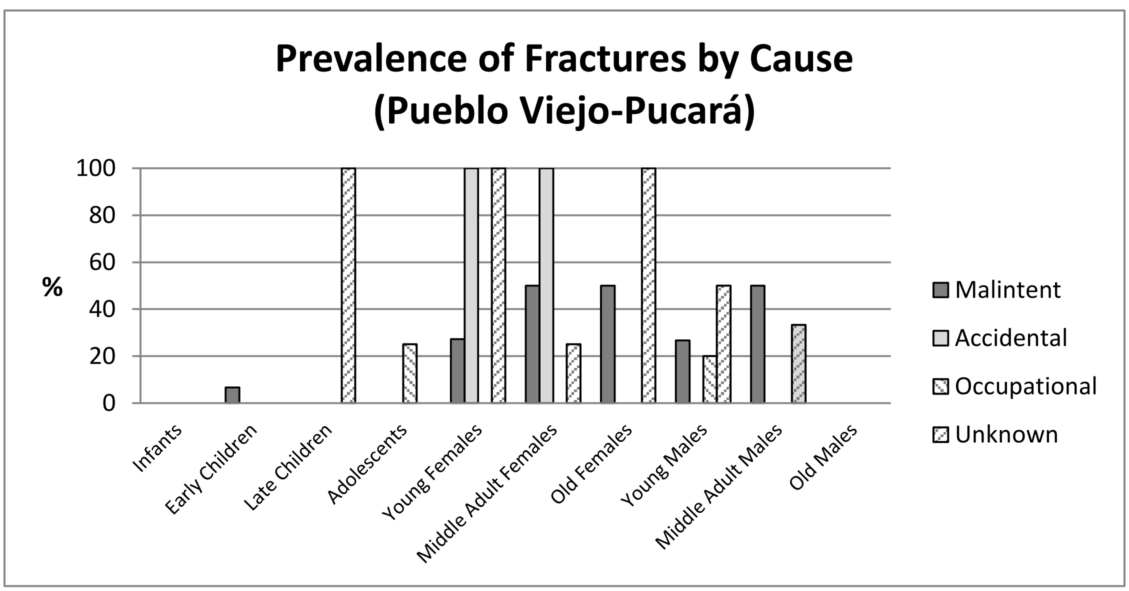

Figure 5.159: Most Probable Cause of Fractures by Age Cohort at the Site of Pueblo Viejo-Pucará

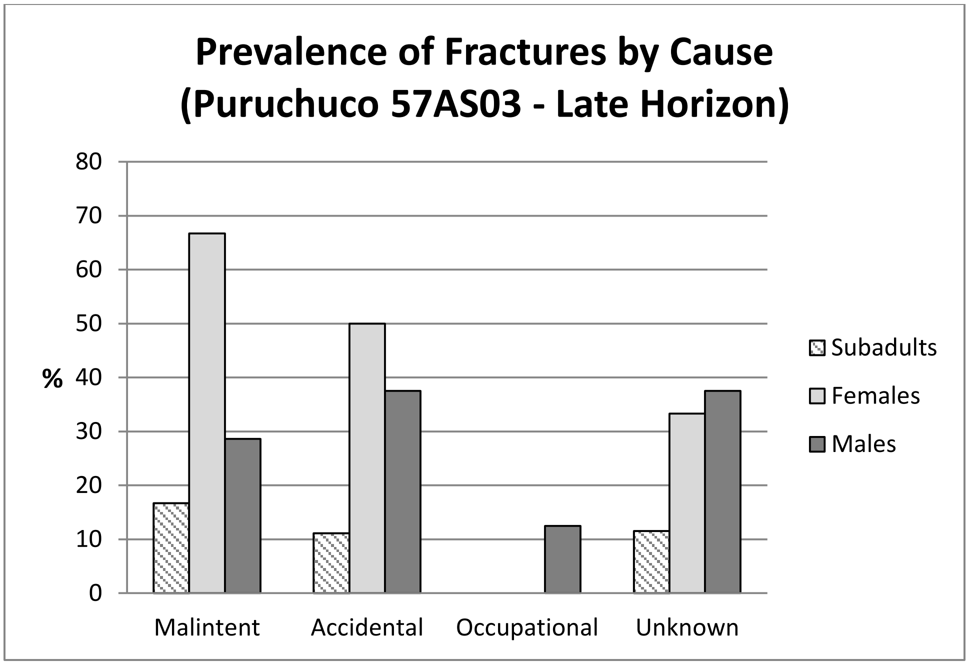

Figure 5.160: Prevalence of Fractures by Most Probable Cause at the Site of Puruchuco-57AS03 (Late Horizon)

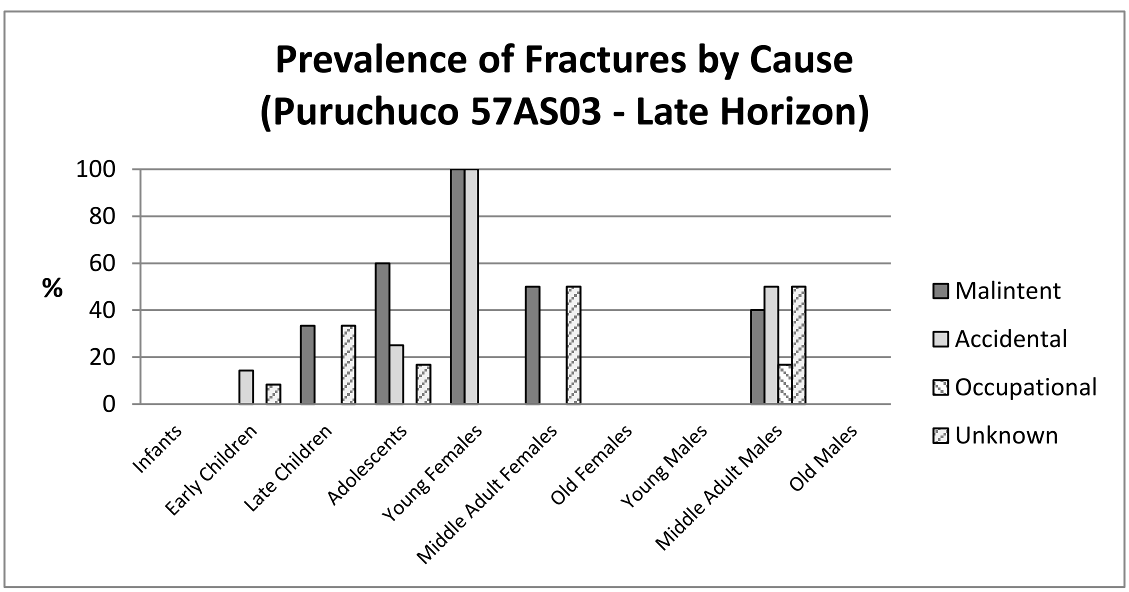

Figure 5.161: Most Probable Cause of Fractures by Age Cohort at the Site of Puruchuco-57AS03 (Late Horizon)

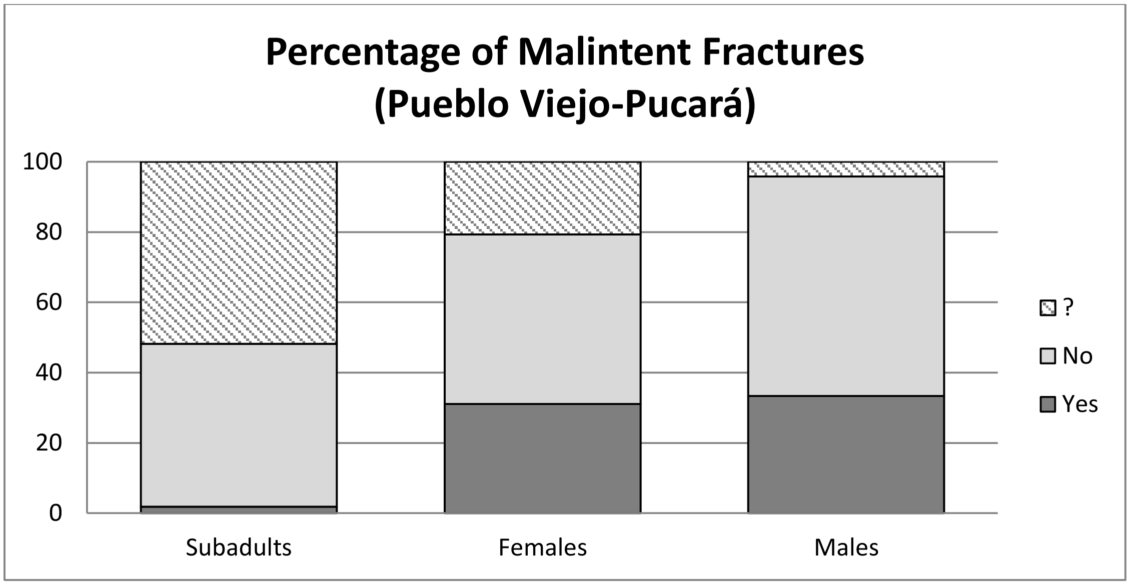

Figure 5.162: Percentage of Malintent Fractures at the Site of Pueblo Viejo-Pucará

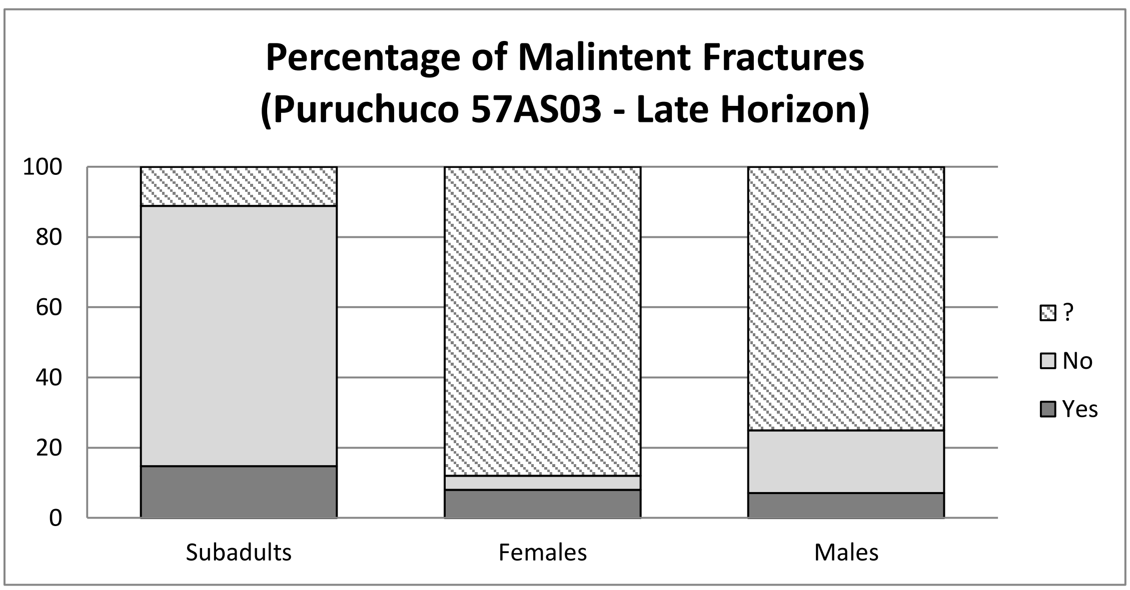

Figure 5.163: Percentage of Malintent Fractures at the Site of Puruchuco-57AS03 (Late Horizon)

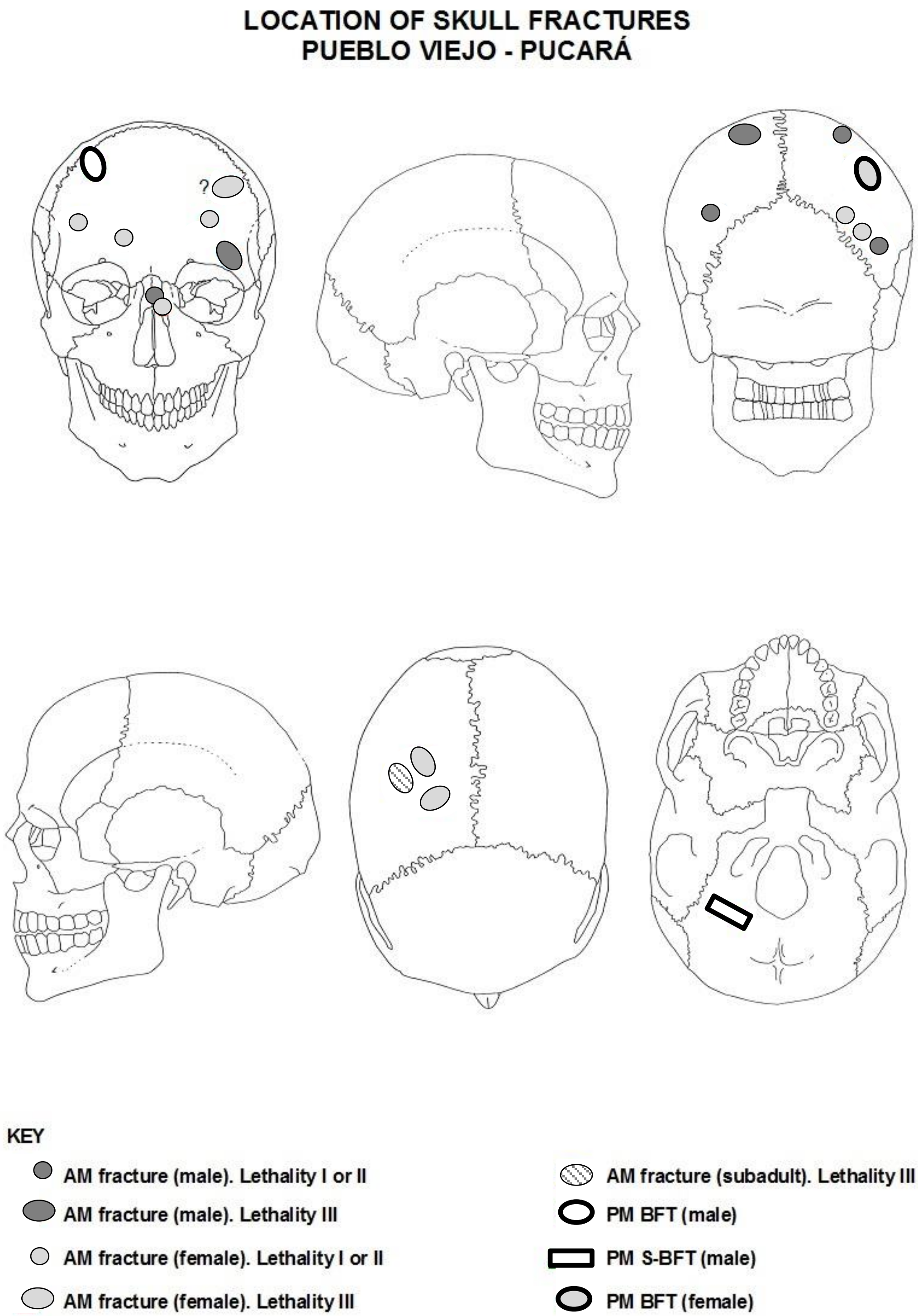

Figure 5.164: Location of Skull Fractures at the Site of Pueblo Viejo-Pucará Based on Sixteen Individuals. Skull Sketches after Buikstra and Ubelaker (1994)

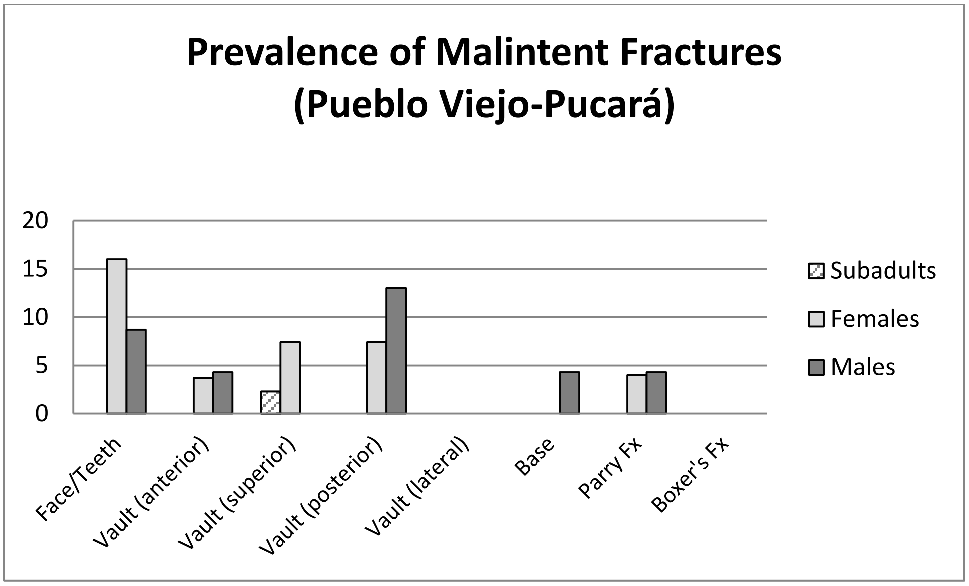

Figure 5.165: Prevalence of Malintent Fractures by Location/Type at the Site of Pueblo Viejo-Pucará

Figure 5.166: Healed Fracture on the Right Side of the Frontal (Pueblo Viejo-Pucará, Sector IV-ET 87-VII, Young Female)

Figure 5.167: Healed Fracture on the Posterior Part of the Left Parietal (Pueblo Viejo-Pucará, Sector IV-ET 87-XXIII, Middle Adult Male)

Figure 5.168: Healed Fracture on the Upper Part of the Right Parietal (Pueblo Viejo-Pucará, Sector IV-ET 87-XV, Early Child)

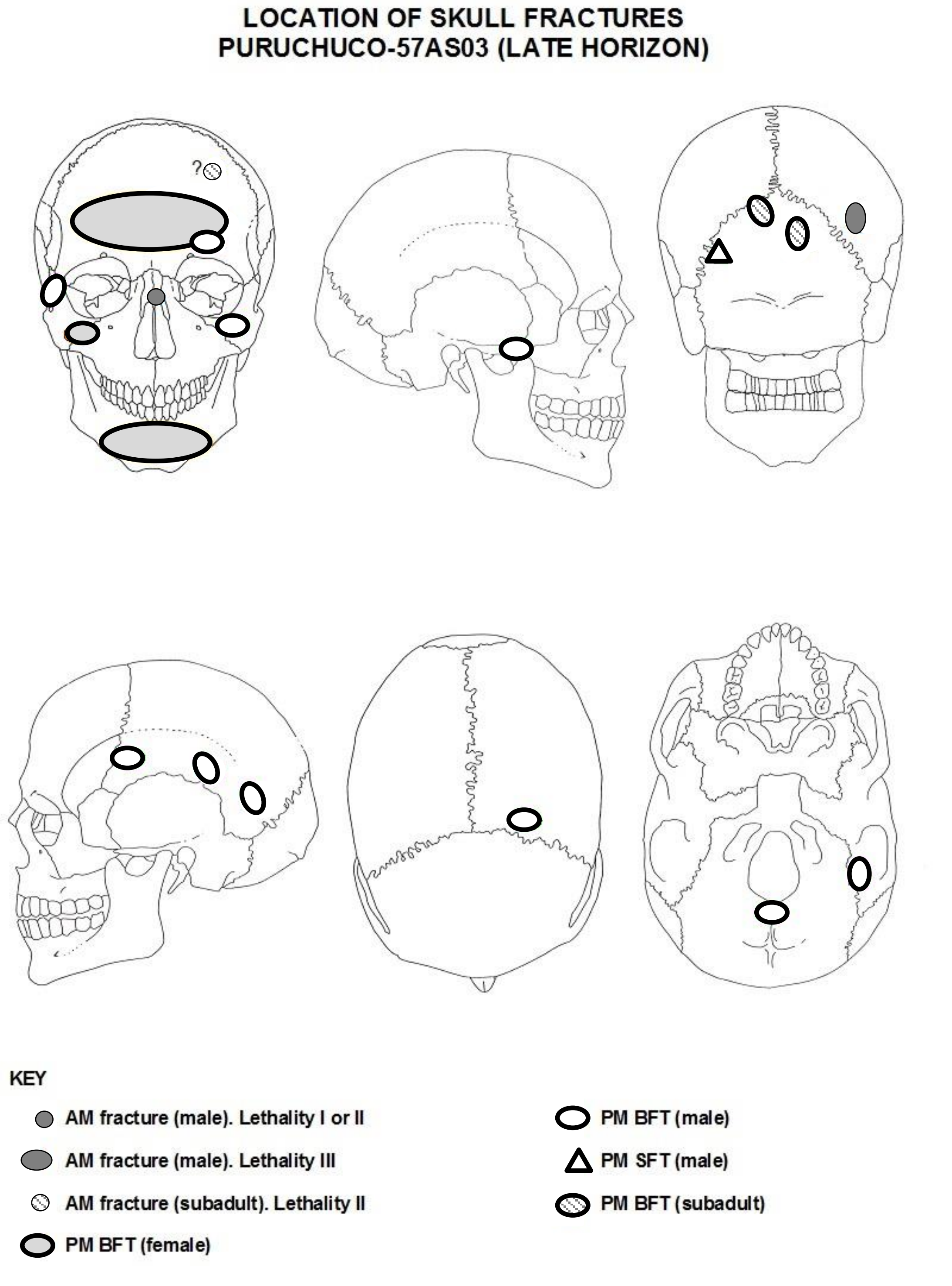

Figure 5.169: Location of Skull Fractures at the Site of Puruchuco-57AS03 (Late Horizon) Based on Seven Individuals. Skull Sketches after Buikstra and Ubelaker (1994)

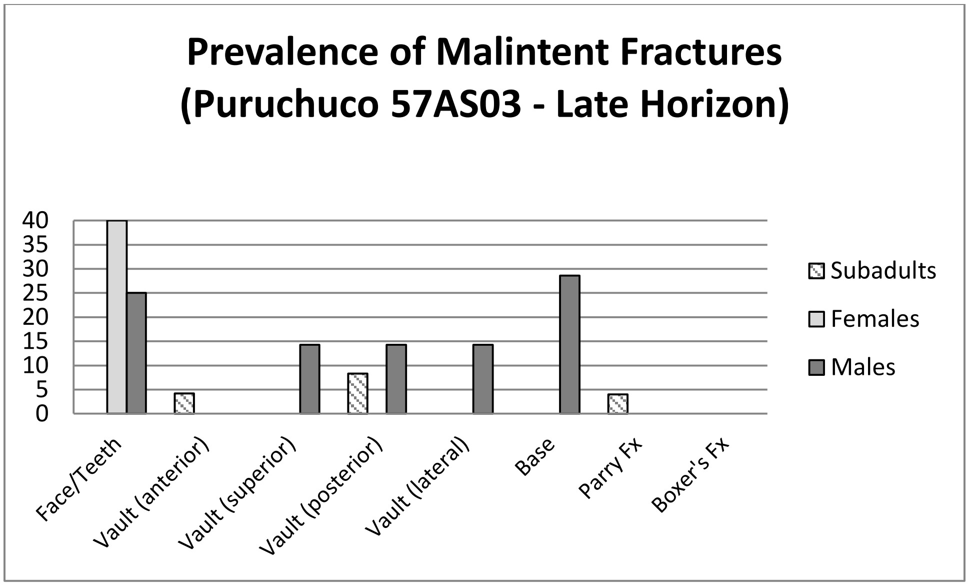

Figure 5.170: Prevalence of Malintent Fractures by Location/Type at the Site of Puruchuco-57AS03 (Late Horizon)

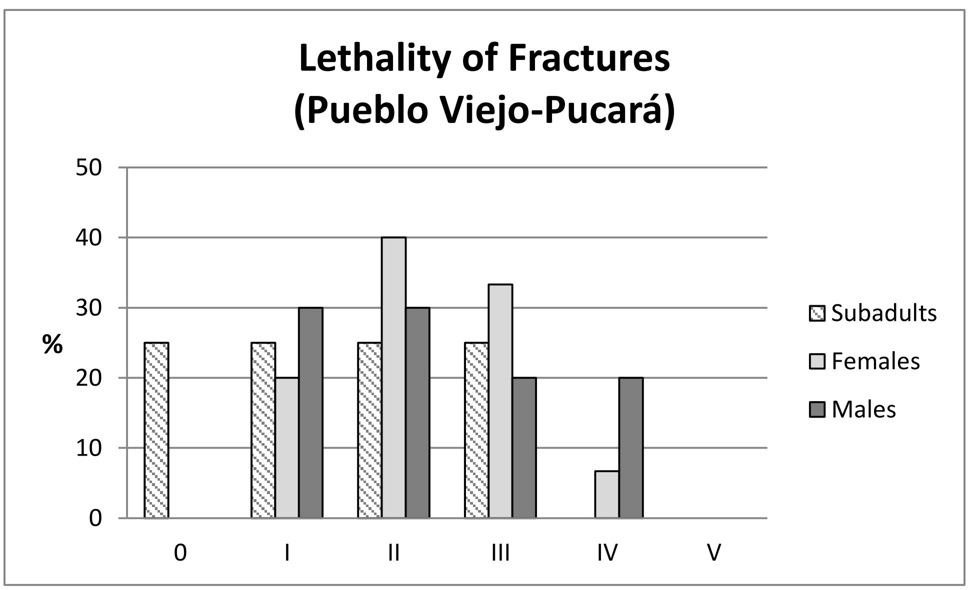

Figure 5.171: Prevalence of Fractures by Lethality at the Site of Pueblo Viejo-Pucará

Figure 5.172: Perimortem Fracture (BFT) to the Right-Upper Aspect of the Frontal (Pueblo Viejo-Pucará, Sector IV-ET 87-XIII, Middle Adult Male)

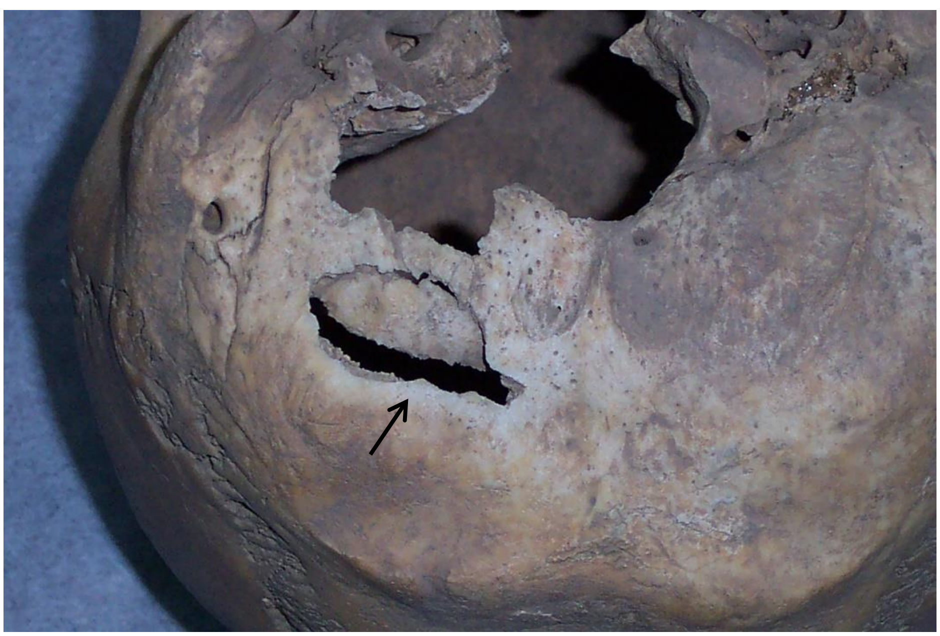

Figure 5.173: Perimortem Fracture (S-BFT) to the Base of the Occipital (Pueblo Viejo-Pucará, Sector IV-CF 3-II, Young Male)

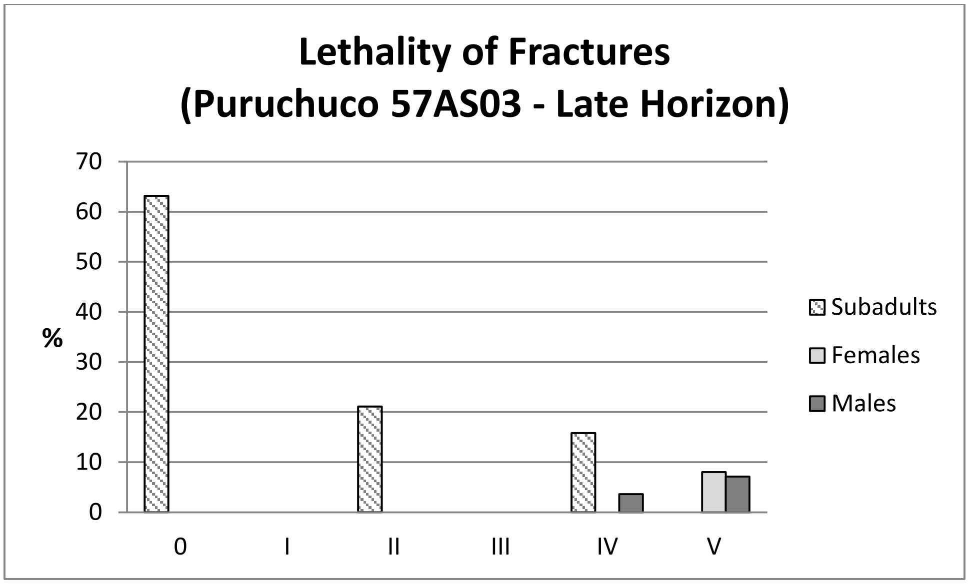

Figure 5.174: Prevalence of Fractures by Lethality at the Site of Puruchuco-57AS03 (Late Horizon)

Figure 5.175: Perimortem Fracture (BFT) to the Right Zygomatic-Maxilla (Puruchuco-57AS03/Late Horizon, T119A, Middle Adult Female). Photo by Cintia Ventocilla

Figure 5.176: Perimortem Fractures (SFT – white arrow – and BFT) to the Occipital (Puruchuco-57AS03/Late Horizon, T121, Middle Adult Male). Photo by Alain Wittmann

Figure 5.177: Close-up View of the SBT of the Last Figure. Photo by Alain Wittmann

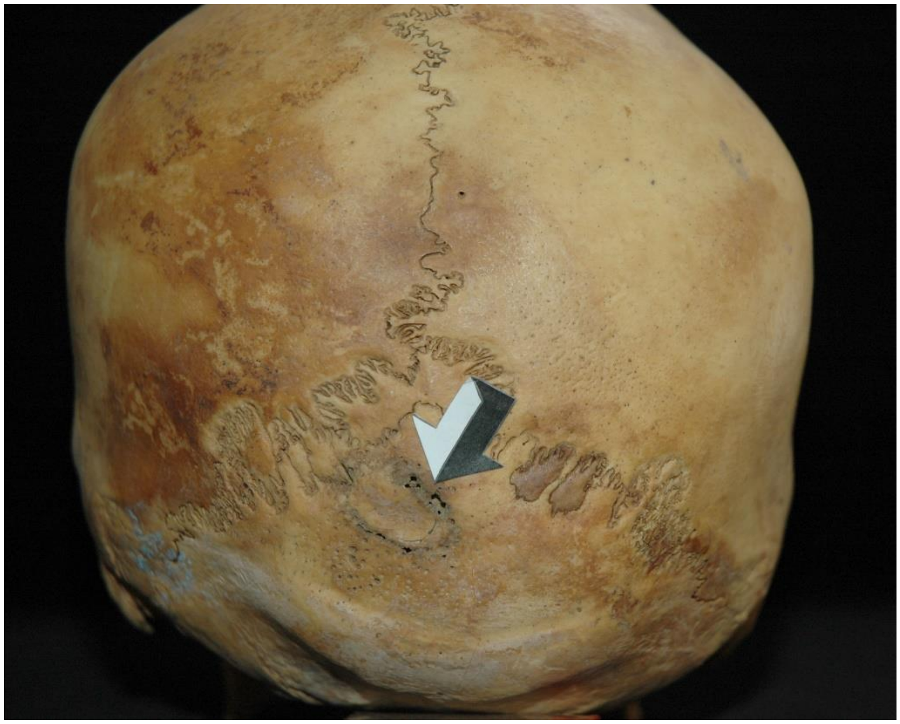

Figure 5.178: Perimortem Fracture (BFT) to the Occipital (Puruchuco-57AS03/Late Horizon, T310, Male Adolescent). Photo by Cintia Ventocilla

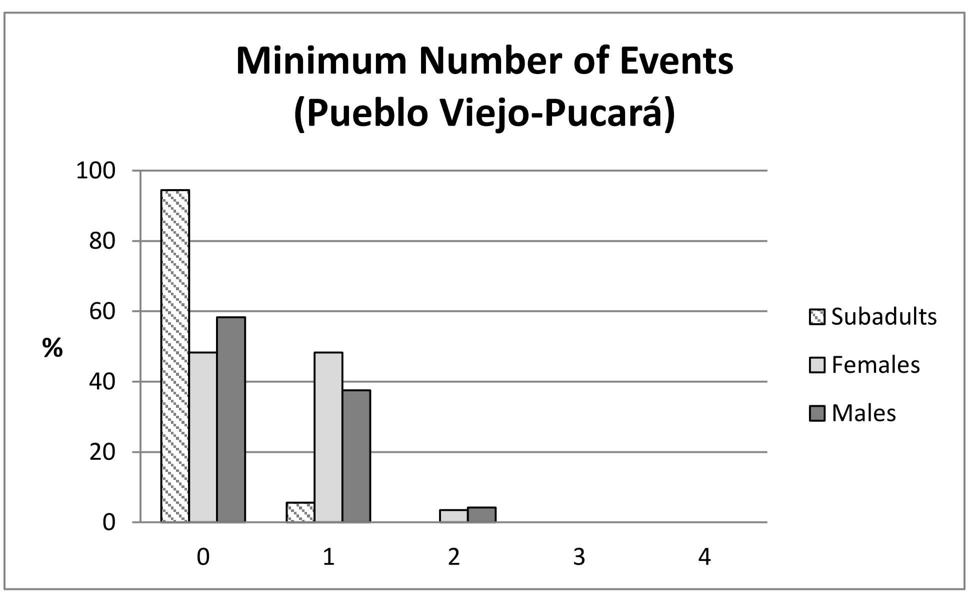

Figure 5.179: Minimum Number of Events at the Site of Pueblo Viejo-Pucará

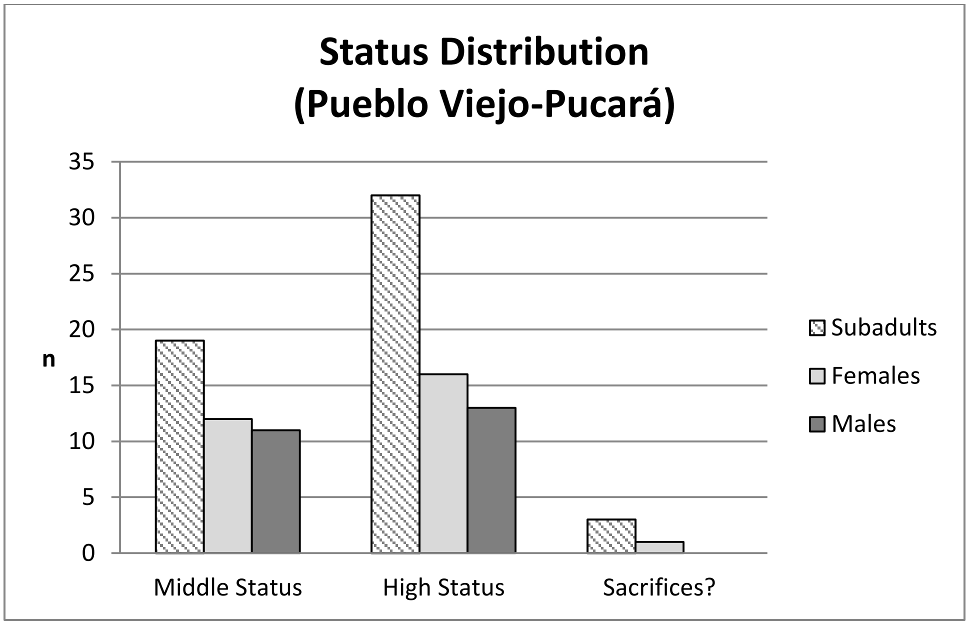

Figure 5.180: Status Distribution at the Site of Pueblo Viejo-Pucará

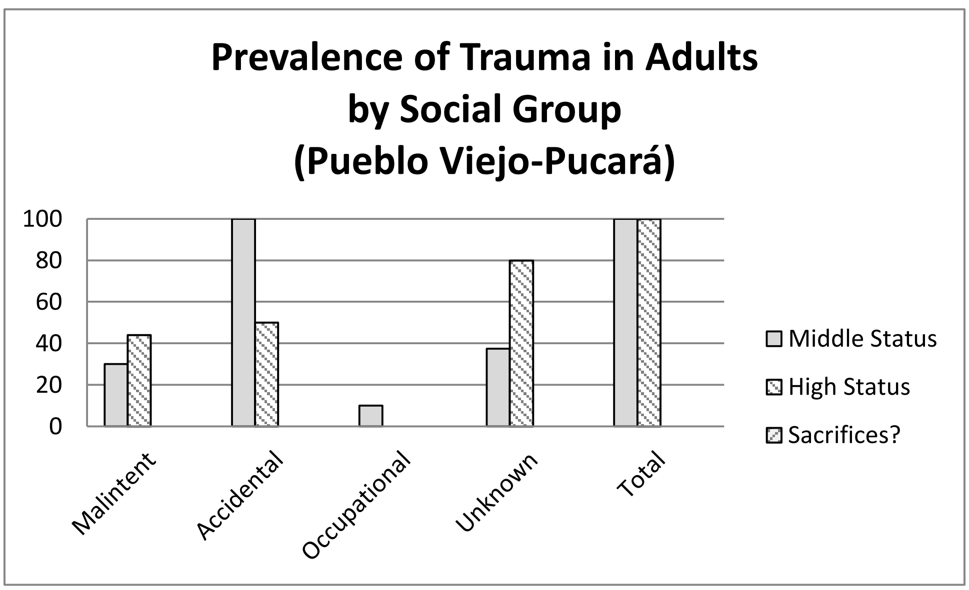

Figure 5.181: Prevalence of Trauma in Adults by Social Status at the Site of Pueblo Viejo-Pucará

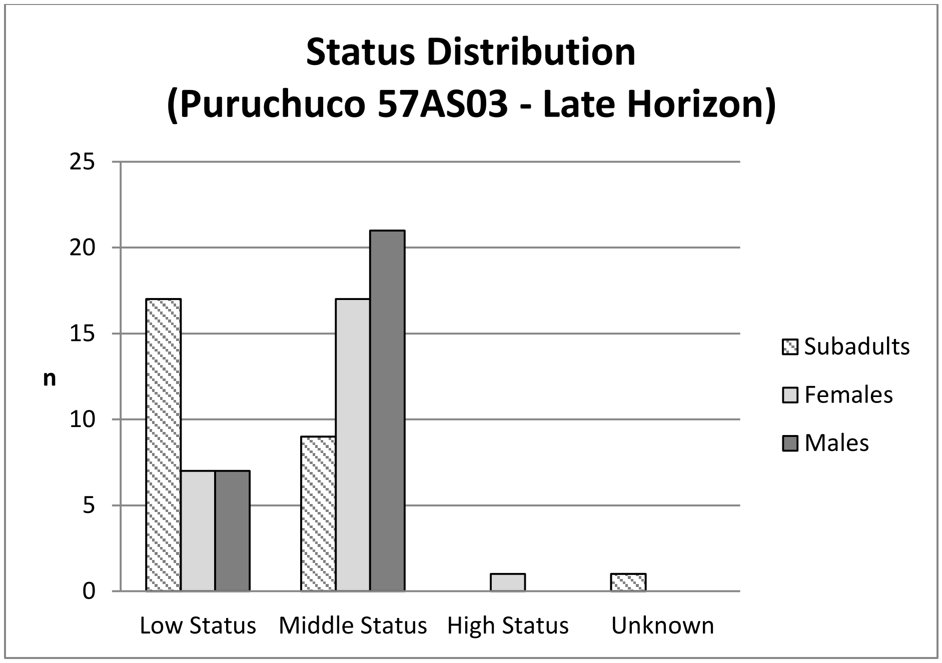

Figure 5.182: Status Distribution at the Site of Puruchuco-57AS03 (Late Horizon)

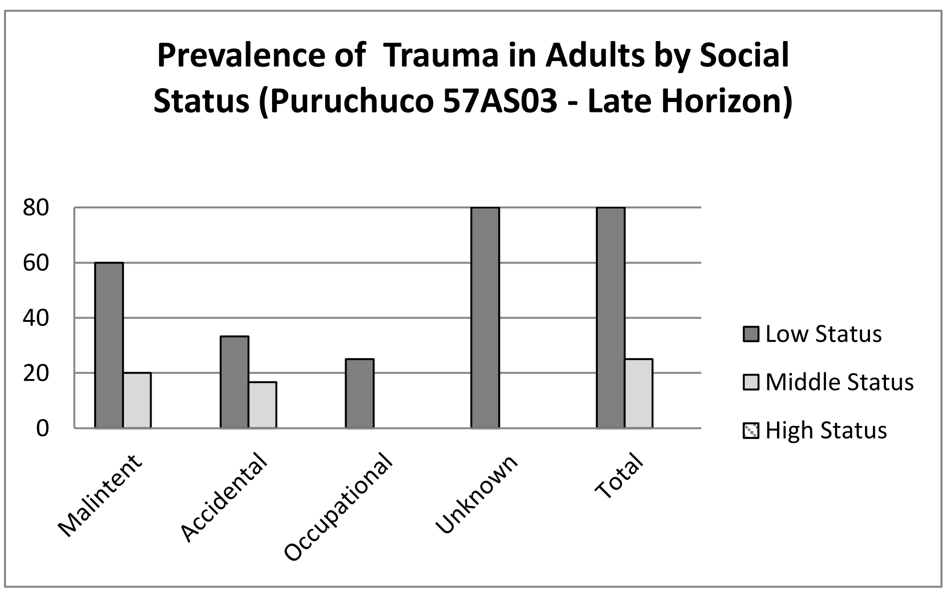

Figure 5.183: Prevalence of Trauma in Adults by Social Status at the Site of Puruchuco-57AS03 (Late Horizon)

5.8 Early Colonial Period

This Early Colonial Period is represented by 37 skeletons recovered by Cock from Puruchuco (57AS03). The data presented here are a reinterpretation of the data of Murphy, Gaither, and Lund. The biological profile of the Puruchuco (57AS03) individuals showed an abnormal number of males (adolescents and adults), who make up almost two thirds of the sample (64.9%). The number of adult males tripled the number of adult females (n = 19 vs. n = 6), with young males especially numerous (35.1%, n = 13). There were no infants or early children (Figure 5.184).

As was the case of the Late Horizon individuals from Puruchuco, the fact that antemortem fracture data were not collected on this material limited the interpretation of the material. Nonetheless, the prevalence of trauma was very high (and mostly of the malintent kind) in subadults (62.5% – n = 5/8 in general, 50% – n = 4/8 in malintent trauma) and males (76.9% – n = 10/13 in general, 50% – n = 8/16 in malintent trauma); affecting especially young males and adolescents. Females only demonstrated a malintent trauma prevalence of 20% – n = 1/5 (odds ratio = 4 – 95% CI 0.36-44.11 when male and female results were compared) (Figures 5.185 to 5.189).

The majority of the malintent wounds (all of them perimortem) in adult males and adolescents (mostly females) were found on the facial and posterior parts of the skull. Female adolescents also presented blunt force lesions on the base of the cranium. This is an area that is difficult to reach unless the neck is hyperflexed (José Pablo Baraybar, personal communication 2016). Thus, it is possible that these individuals were killed after they were captured, when they were in a submissive position. The majority of lesions were produced by blunt force. However, there were two cases of males with sharp force trauma and another two with gunshot wounds. One female adolescent also had a sharp-blunt force lesion (Figures 5.190 to 5.196). Lund also reported a middle adult female with an antemortem fracture in the shaft of the right fourth metacarpal. Although no photo was provided to confirm this trauma, I considered it a boxer’s fracture.

The prevalence of fatal wounds during this time was very high: 58.8% (n = 10/17) of the adult males, 50% (n = 5/10) of the subadults, and 50% (n = 2/4) of the females presented at least one perimortem trauma. The prevalence of extremely violent trauma (lethality V) was the highest of all the time periods seen in this study, affecting 40% (n = 4/10) of the adolescents, 25% (n = 1/4) of the females, and 35.3% (n = 6/17) of the males (Figure 5.197). When adolescents with sex determination were added to adults, males demonstrated 57.1% (n = 12/21) and females 50% (n = 5/10) of prevalence of fatal lesions (42.9%, n = 9/21 and 36.4%, n = 4/11 in malintent fatal wounds). Although there was a slight tendency for males to have more fatal wounds than females, the difference was not statistically significant (odds ratio = 1.43 – 95% CI 0.16-12.70 when only adult males and females were compared). Besides the cranial wounds, perimortem lesions were detected in other parts of the body, especially in thorax and pelvis. Using only Lund's more complete information, it was established that 25% (n = 1/4) of the females and 40% (n = 4/10) of the males presented a MNEv of 2. A MNEv of 3 was detected in 12.5% (n = 1/8) of the subadults (Figure 5.198).

Most of the individuals were classified as low status (75.7%, n = 28), while the rest were assigned to the middle status group (24.3%, n = 9), with no clear distinction in the age cohort distribution inside each group (Figure 5.202). As happened with individuals from the same site but previous period, many of the males were identified as soldiers and a great number of the females were classified as weavers (based on the associated grave goods). Perimortem accidental trauma was more common among middle status individuals than in the low status group (60% – n = 3/5 vs. 16.7% – n = 2/12, odds ratio = 7.5 – 95% CI 0.72-78.37) (Figure 5.199). However, the strong association between malintent fractures (some of them clearly related to weaponry) and the other types of perimortem trauma suggests that all these fractures could be related to a single violent event. There was no statistically significant difference between the prevalence of perimortem trauma in "soldiers" (males and adolescents) and "non-soldiers" of the same age cohorts. However, contrary to what happened in the previous period, there was a tendency for "non-soldiers" to present more perimortem lesions (66.7% – n = 8/12 vs. 44.4% – n= 4/9, odds ratio = 2.5 – 95% CI 0.42-14.83).

In sum, this sample is distinctive on the basis of its unusual number of males; three times greater than the number of females. The presence of perimortem trauma (especially malintent) was high; between 50% and 60% of the individuals presented at least one perimortem traumatic lesion, most commonly expressed in adolescents and young males. Most of the males and adolescents demonstrated lesions on the facial and posterior parts of the skull. The prevalence of fatal lesions was slightly higher in males than in females. No difference was found in the prevalence of perimortem fractures between low and middle status adults. However, the prevalence of fatal fractures in "non-soldiers" was slightly higher than in "soldiers" (contrary to what happened in the previous time period).

This sample was the first in which the prevalence of perimortem trauma (especially the extremely violent kind) surpassed the prevalence of the antemortem lesions. However, it must be noted that antemortem data from adults is limited to the few cases that Lund recorded, as Murphy's publications only presented perimortem lesions. The strong association between cranial fractures (some of them clearly related to weaponry) and the other types of perimortem trauma (mainly in thorax and pelvis) indicates that all these fractures could be related to a single violent event.

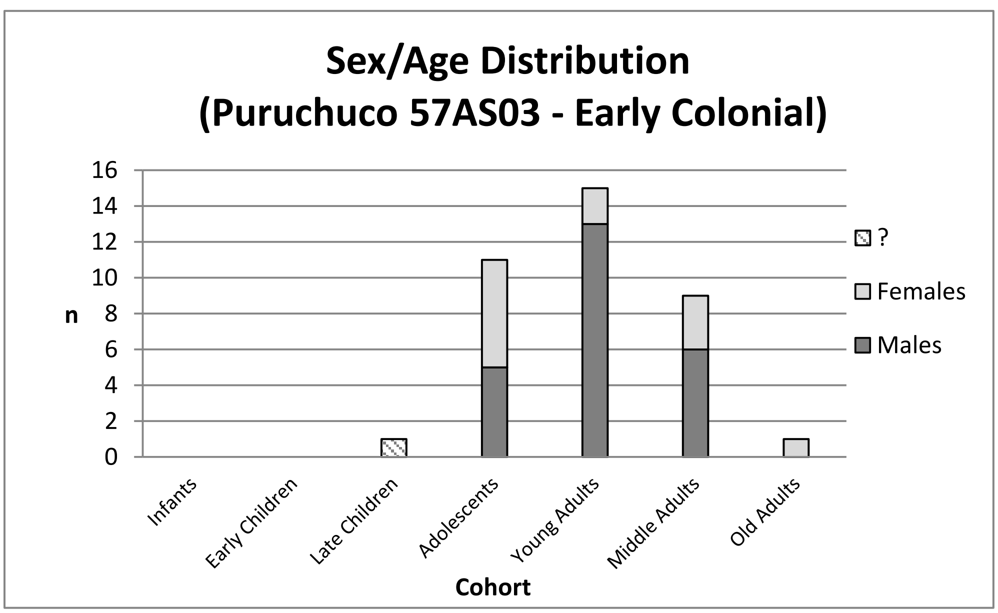

Figure 5.184: Sex and Age Distribution at the Site of Puruchuco-57AS03 (Early Colonial)

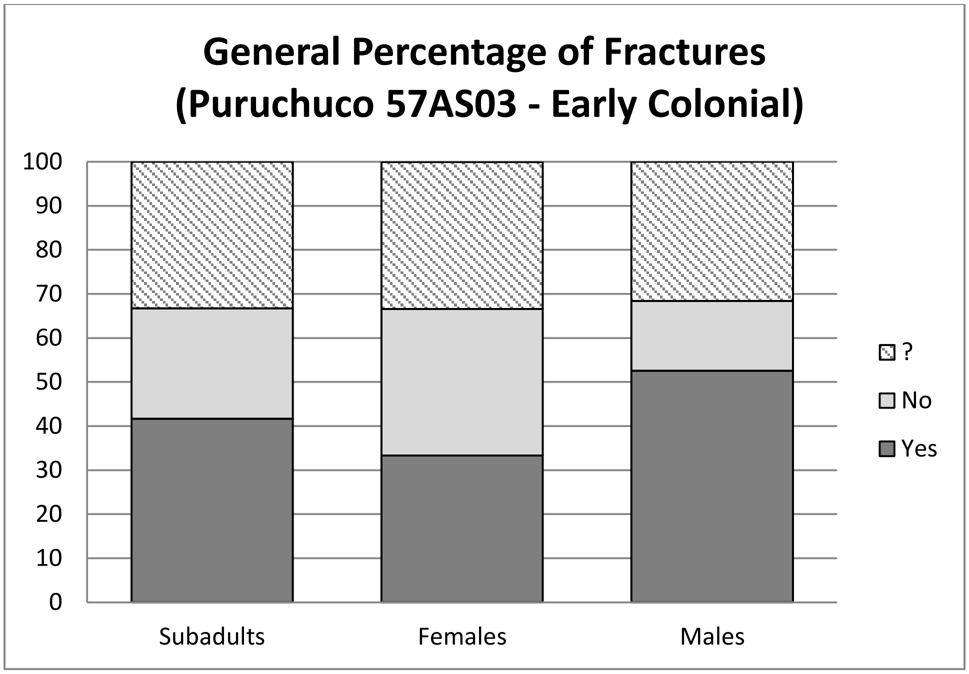

Figure 5.185: General Percentage of Fractures in Subadults, Females, and Males from Puruchuco-57AS03 (Early Colonial)

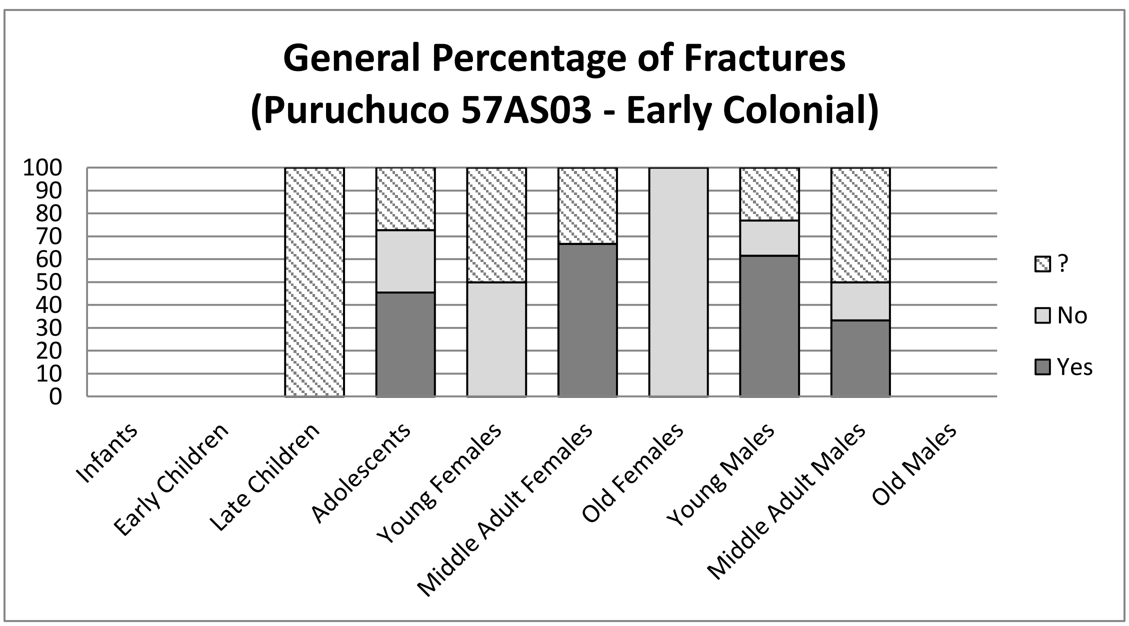

Figure 5.186: General Percentage of Fractures by Age Cohort at the Site of Puruchuco-57AS03 (Early Colonial)

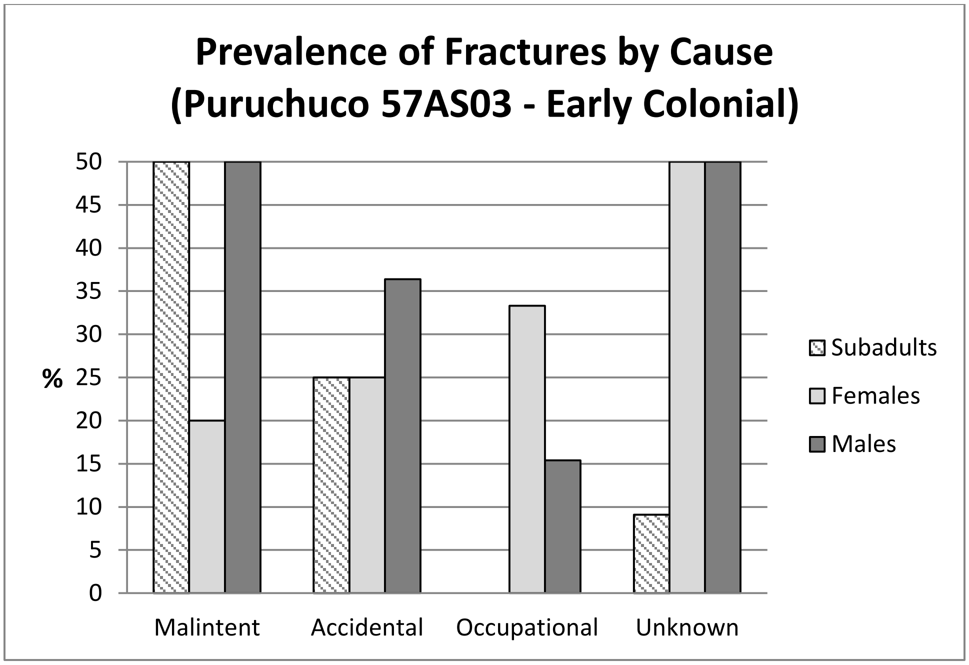

Figure 5.187: Prevalence of Fractures by Most Probable Cause at the Site of Puruchuco-57AS03 (Early Colonial)

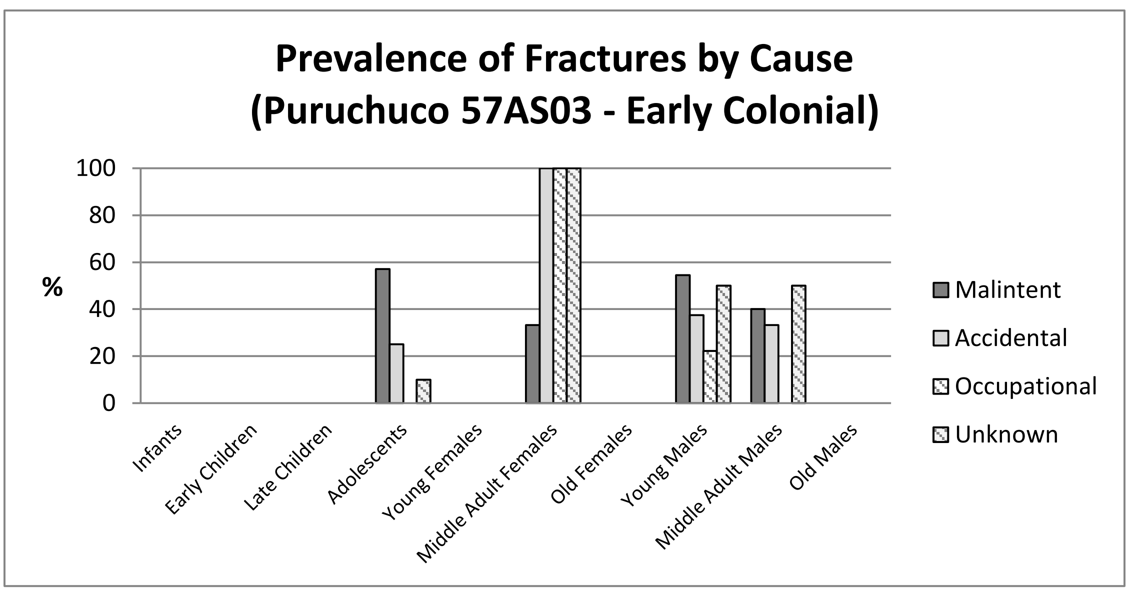

Figure 5.188: Most Probable Cause of Fractures by Age Cohort at the Site of Puruchuco-57AS03 (Early Colonial)

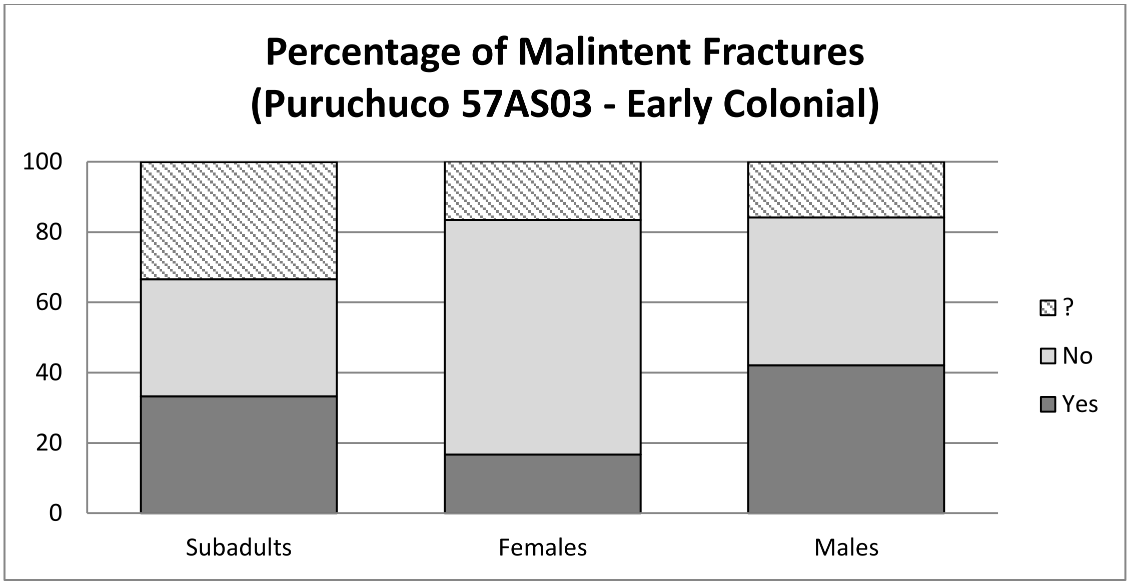

Figure 5.189: Percentage of Malintent Fractures at the Site of Puruchuco-57AS03 (Early Colonial)

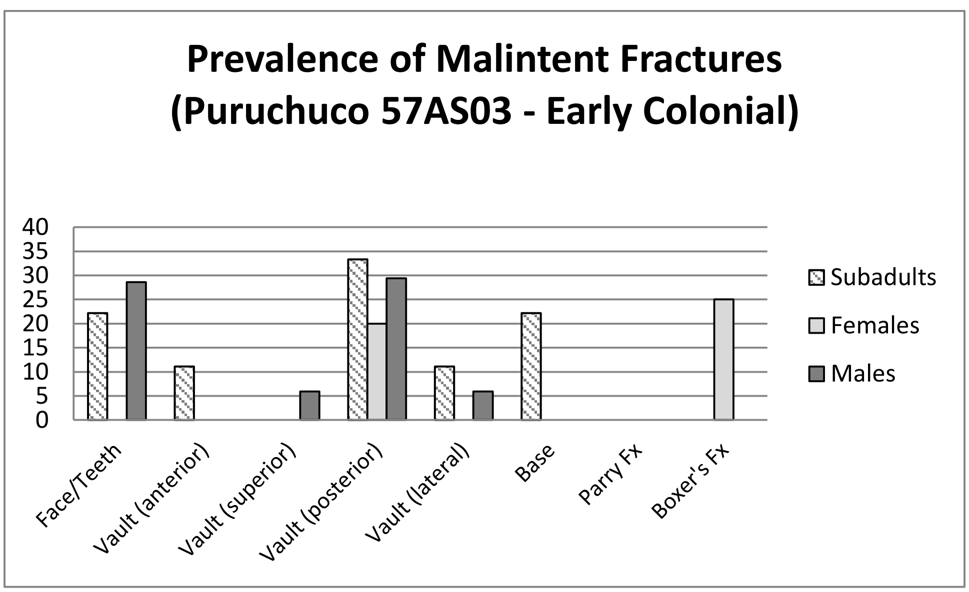

Figure 5.190: Prevalence of Malintent Fractures by Location/Type at the Site of Puruchuco-57AS03 (Early Colonial)

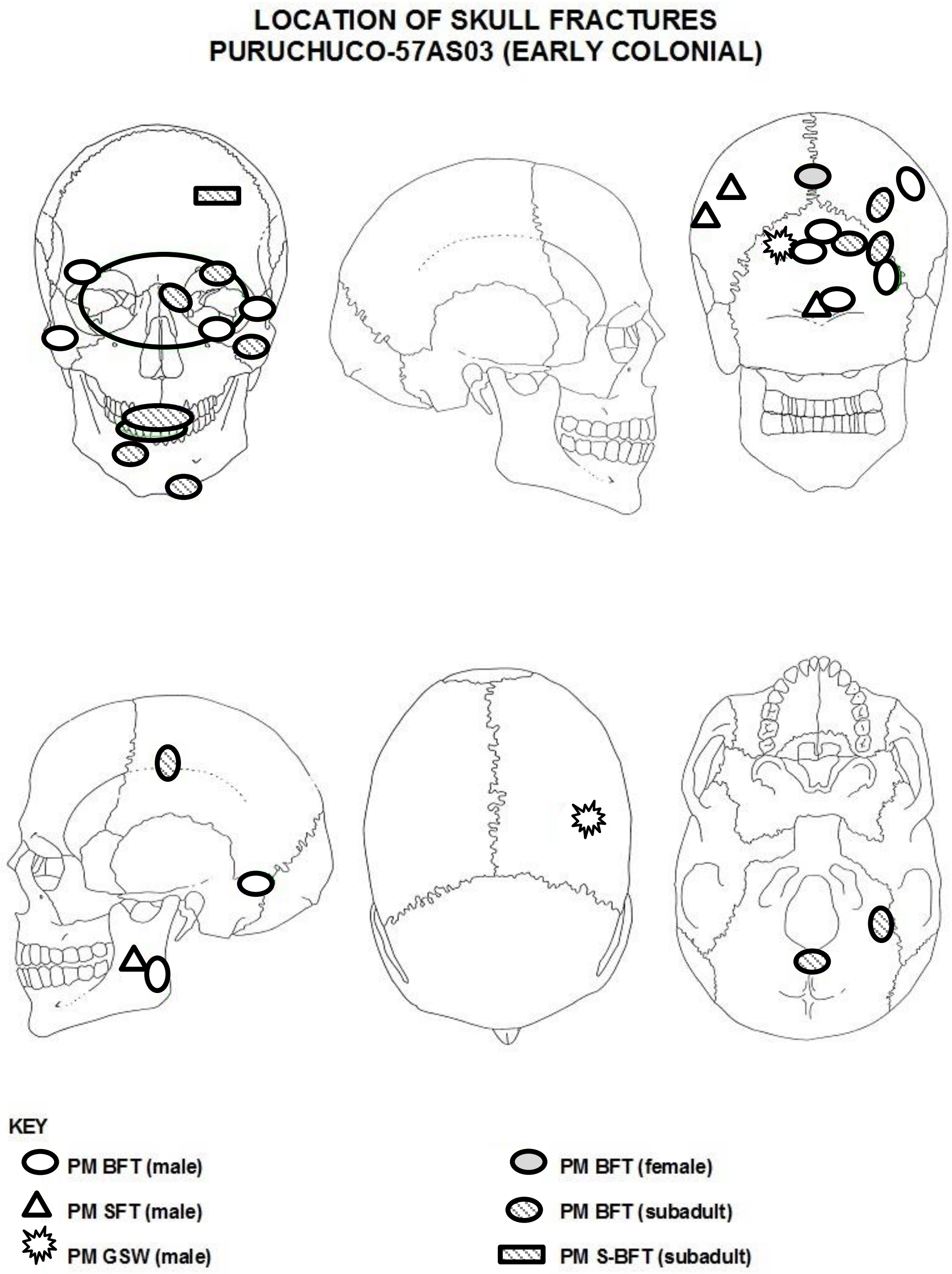

Figure 5.191: Location of Skull Fractures at the Site of Puruchuco-57AS03 (Early Colonial) Based on Thirteen Individuals. Skull Sketches after Buikstra and Ubelaker (1994)

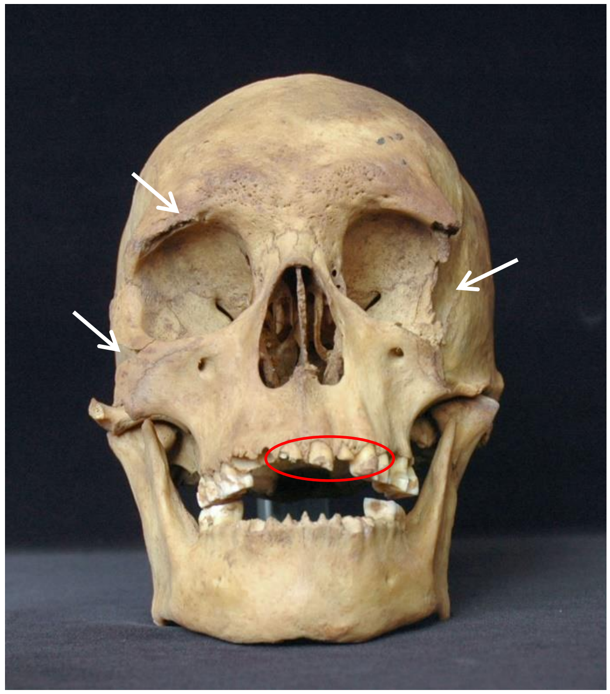

Figure 5.192: Perimortem Fractures (BFT) to the Face and Teeth (Puruchuco-57AS03/Early Colonial, T368, Middle Adult Male). Photo by Cintia Ventocilla

Figure 5.193: Perimortem Fractures (BFT and S-BFT) to the Left Anterior Part of the Skull (Puruchuco-57AS03/Early Colonial, T231, Female Adolescent). Photo by Alain Wittmann

Figure 5.194: Perimortem Fractures (BFT) to the Posterior Part of the Skull (Puruchuco-57AS03/Early Colonial, T176, Middle Adult Female). Photo by Cintia Ventocilla

Figure 5.195: Close-up View of a GSW to the Occipital (Puruchuco-57AS03/Early Colonial, T151, Young Male). Photo by Cintia Ventocilla

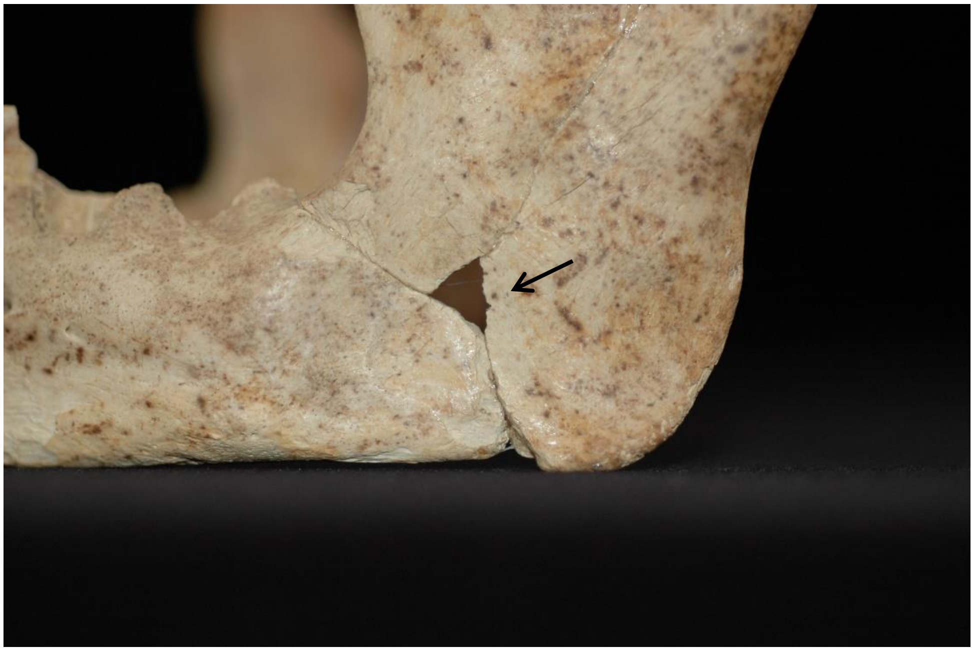

Figure 5.196: Close-up View of a SFT Lesion to the Mandible (Puruchuco-57AS03/Early Colonial, T151, Young Male). Photo by Cintia Ventocilla

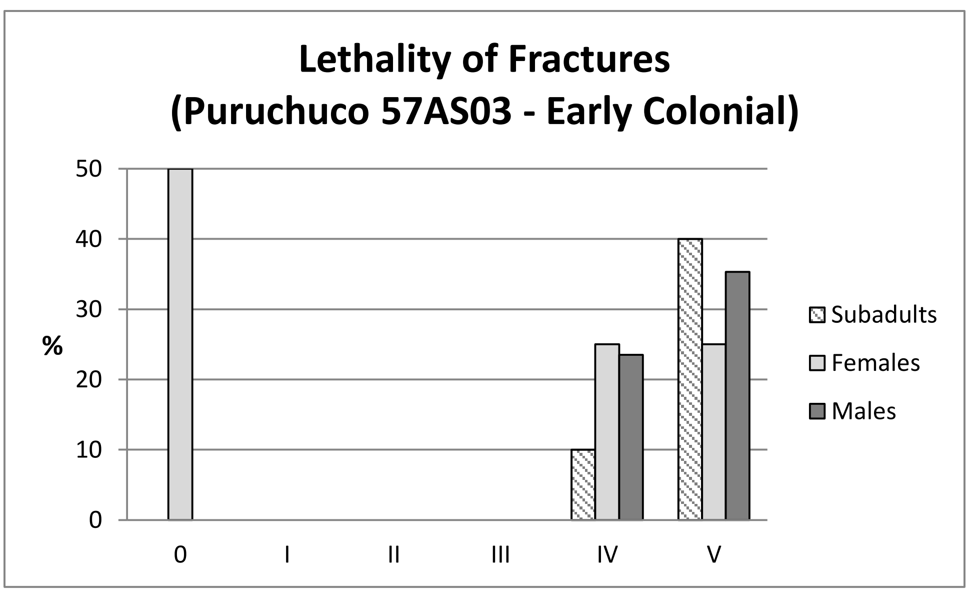

Figure 5.197: Prevalence of Fractures by Lethality at the Site of Puruchuco-57AS03 (Early Colonial)

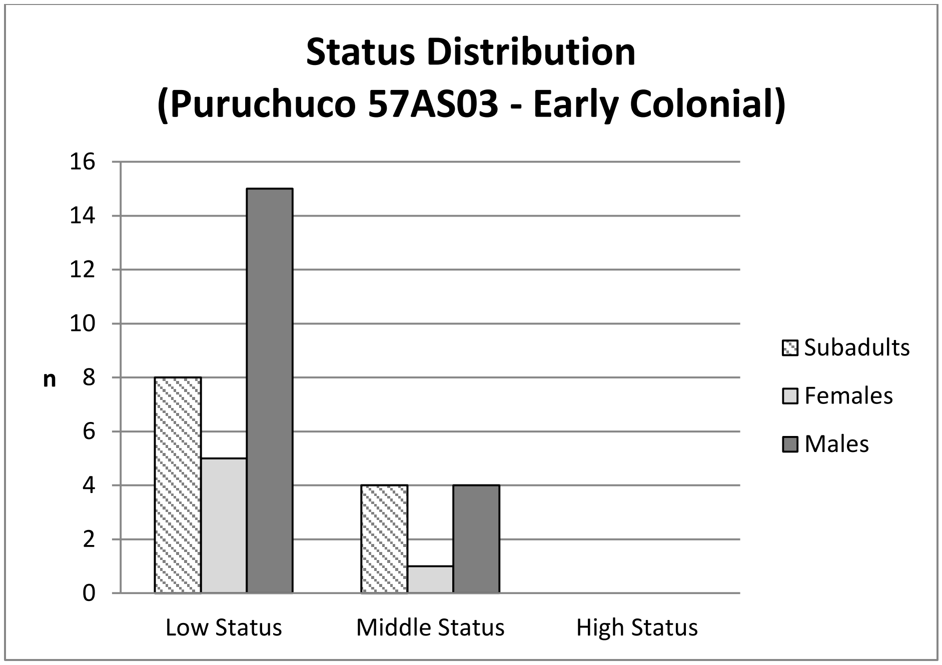

Figure 5.198: Status Distribution at the Site of Puruchuco-57AS03 (Early Colonial)

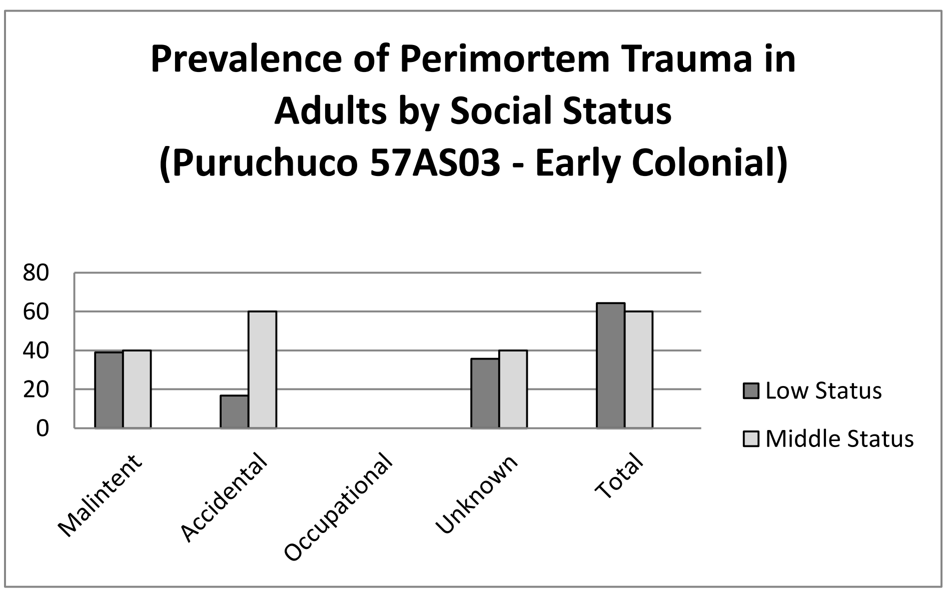

Figure 5.199: Prevalence of Perimortem Trauma in Adults by Social Status at the Site of Puruchuco-57AS03 (Early Colonial)

Chapter 6

6 Results, Part II: Intra and Inter Regional Comparisons

As was done in Chapter 5), the results presented in this chapter are arranged by time periods. Three items are covered in this chapter. First, I identify the most probable manifestation of violence underlying the pattern of trauma shown for each time period, based on the literature reviewed in Chapter 2 (summarized in this chapter in Table 6.1). As was already presented in Chapter 4, a prevalence of 10% and below is considered "very low", between 11 and 20%, "low", between 21 and 30%, "moderate", between 31-50%, "high", and above 50%, "very high".

Table 6.1: Patterns of Malintent Trauma

Violence Manifestation	Most Affected Segment of Population	Most Recurrent Lesions and Place of Burial
Physical conflict resolution	Adult Males	Healed traumatic lesions on the anterior part of the skull, usually in the left side.
War and Warfare	Young Males	High prevalence of healed and unhealed lesions on the torso, the anterior or posterior part of the skull and parry fractures. Rarely buried in a cemetery.
Raiding/Female Abduction	Adult Females	Healed fractures on the back of the skull (followed by lesions on the anterior part of the skull). Possibly multiple trauma or re-injury. Males could also present non-lethal and lethal lesions on the anterior or posterior part of the cranium.
Surprise Ambush/Assault	Adult Males	Perimortem cranial and infra-cranial lesions. Small group of people buried together.
Massacre	Adults and Subadults	Individuals buried together, +50% of them showing perimortem lesions on different parts of the skeleton (especially on the cranium).
Ritual Battle	Adult Males	Single or multiple non-lethal wounds, especially on the facial bones. Low prevalence of perimortem trauma.
Violence against Women -IPV (Domestic Abuse)	Adult Females	Injuries in diverse states of healing on the skull and ribs.
Child Abuse	Children and Infants	Cranial fractures in individuals under 2 years old. Long bone fractures in individuals under 18 months. Proliferative and unorganized PNBF. Multiple trauma in diverse states of healing.

Secondly, the study sample is compared to the data for other sites of the central coast of the same time period presented by other investigators. In this way, it is established if the manifestation of violence found at one site was an exclusive phenomenon or not, giving a more comprehensive view of violence for the time period.

Finally, information on specific periods is compared with what was found in other Andean regions and in the previous time period. While comparisons with previous time periods could show possible changes in the prevalence and patterns of trauma over time, the comparisons with other Andean regions helps to establish if the levels and patterns of violence seen in the central coast during a specific time period was an exclusive phenomenon of this area or not. In this way, we can determine, for example, if the expansion of the Wari and Inca Empires brought more violence in all the conquered territories or if some areas were non-violently annexed. Equally, we can establish if the severe droughts that occurred during the Early and Late Intermediate Periods were associated with rise of the prevalence of malintent trauma in different areas or not. For comparative reasons, only prevalence of skull fractures (including the facial area) is used, since many investigators based their analysis of malintent/non-ritual violence on cranial data. Perimortem trauma in sacrificed individuals was not considered.

6.1 Early-Late Formative Period

6.1.1 Violence in La Capitana and Asia-León Dormido

The results presented in the previous chapter showed that the prevalence of malintent trauma was low to very low. No female or subadult, and only 16.7% of males (two young adults: one with a fracture in the right frontal bone, the other with a boxer’s fracture in the right hand) presented any fracture related to violence. In a conservative approach (only considering fractures produced in skulls, above the “hat brim line”, see Martin and Harrod 2015), the prevalence dropped to 8.3% in males. The place and characteristics of these isolated and non-fatal lesions (considered of low and high lethality) are consistent with physical conflict resolutions (Arkush and Tung 2013), in which the way of fighting implied face-to-face confrontations and the use of hands and possibly stones as weapons.

Moreover, no case of malintent trauma was found in any of the four sites of Asia-León Dormido that composed this sample. However, it must be acknowledged that the poor preservation of the remains could have affected the results both in La Capitana and Asia-León Dormido.

6.1.2 Other Early-Late Formative Period Sites of the Central and South-Central Coast

Bioarchaeological samples available for Early to Late Formative sites of the central and south-central coast are limited to the Cardal collection (Initial Period/Early and Middle Formative). Vradenburg (2001:Table 24) reported the presence of antemortem compression fractures in one (out of 10) male crania. None of the eight female crania presented any kind of fracture. Thus, both Cardal and my combined sample (La Capitana-Asia-León Dormido) presented a very low prevalence of malintent (cranial) trauma; all of them, antemortem fractures in males. The combined data of the three areas gave a prevalence of malintent (cranial) fractures in males of 6.1%.

6.1.3 Malintent Trauma in Early-Late Formative Period Samples from Other Regions

Data collected from the Peruvian north coast (Gillespie 1998; Klaus 2014[98]; Pezo 2010[99]), north highlands (Matsura et al. 1997), the Titicaca basin (Blom and Bandy 1999; Juengst 2015), and northern Chile (Fouant 1984) showed few or no cases of malintent trauma. Only around 5-10% of the adults of the Copacabana Peninsula individuals studied by Juengst (2015) presented some kind of skull trauma (three antemortem and three perimortem). Likewise, there was only one case of penetrating perimortem trauma to a left temporal found in Kuntur Wasi (northern highlands) (Matsura et al. 1997). Therefore, it is possible that the low level of violence detected in the central coast was

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[98] Unfortunately, Klaus (2014) did not provide the exact number of individuals (or if they were adults or subadults).

[99] Gillespie and Pezo made independent studies on the same material excavated by Elera (1998). Albeit both coincided in that none of the individuals from the Puémape (Formative) phases showed skull trauma, their sex determination differed in some cases. Pezo also identified one young female with a perimortem projectile injury in the sacrum.

also experienced in these areas. Nonetheless, despite the fact that the rates of malintent trauma could be considered low, the presence of perimortem trauma in Puémape (north coast), Kuntur Wasi, and in the Titicaca Basin (Yaya-Mama Religious Tradition) indicates that the severity of violence was greater in these regions than on the central coast, as perimortem trauma was absent in the central coast samples.

It must be noted that the number of skeletons from this time period that are complete enough to allow detailed observations is very small. Thus, it is possible that the poor preservation of the remains is hiding the real prevalence of trauma in many regions. Evidence of possible cases of cannibalism found in some sites of the Early Horizon-Late and Final Formative period such as Ñañañique (north coast) and Chavín de Huántar (north-central highlands) (Baraybar 1993; Guffroy and Baraybar 1994). Although cannibalism could be related to ritual activities, it could also be associated with violence. If so, violence in the northern region could have been higher than what the prevalence of malintent trauma suggests.

The data available for the different Andean regions mentioned above are presented in Table 6.2 and Figure 6.1.

6.1.4 Comparison with the Pre-Ceramic Period

The very low prevalence of malintent trauma of the Early-Late Formative period on the central coast seems to be a continuation of the (apparent) non-existence or low prevalence of violence presented during the Pre-Ceramic period, as was deduced by the absence of malintent trauma among the individuals of Paloma (Benfer 1984; Quilter 1989).

Table 6.2: Prevalence of Cranial Fractures Found in Different Andean Regions during the Early-Late Formative Period

			Prevalence of Cranial Trauma			
Site and Region	**Culture/ Phase**	**Reference**	**Males**	**Females**	**Adults combined**	**Subadults**
La Capitana (central coast)	Early-Middle Formative	This study	8.3% (1/12)	0% (0/4)	6.3% (1/16)	0% (0/9)
Asia-LD (south-central coast)	Early-Late Formative	This study	0% (0/11)	0% (0/8)	0% (0/19)	0% (0/4)
Cardal (central coast)	Early-Middle Formative	Vradenburg 2001	10% (1/10)	0% (0/8)	5.6% (1/18)	-
Puémape (north coast)	Early-Classic Cupisnique	Gillespie 1998* Pezo 2010*	0% (0/~12)	0% (0/~18)	0% (0/~30)	0% (0/~30)
Morro de Eten (north coast)	Classic-Late Cupisnique	Klaus 2014	-	-	0% (0/?)	0% (0/?)
Cajamarca (north highlands)	Early Huacaloma-Kuntur Wasi	Matsura et al. 1997*	16.7% (1/6)	0% (0/2)	12.5% (1/8)	-
Chiripa (Bolivia)	Early to Late Chiripa	Blom and Bandy (1999)*	0% (0/1)	0% (0/5)	0% (0/6)	0% (0/4)
Copacabana Pen. (Bolivia)	Yaya-Mama Religious Tradition	Juengst 2015*	?	?	4.0-6.1% (6/99?)	0%? (0/9?)
Azapa Valley (northern Chile)	Azapa	Fouant 1984*	0% (0/2?)	0% (0/2?)	0% (0/4?)	0% (0/5?)

* Prevalence calculated based on data presented in that study. Only observable cases were included.

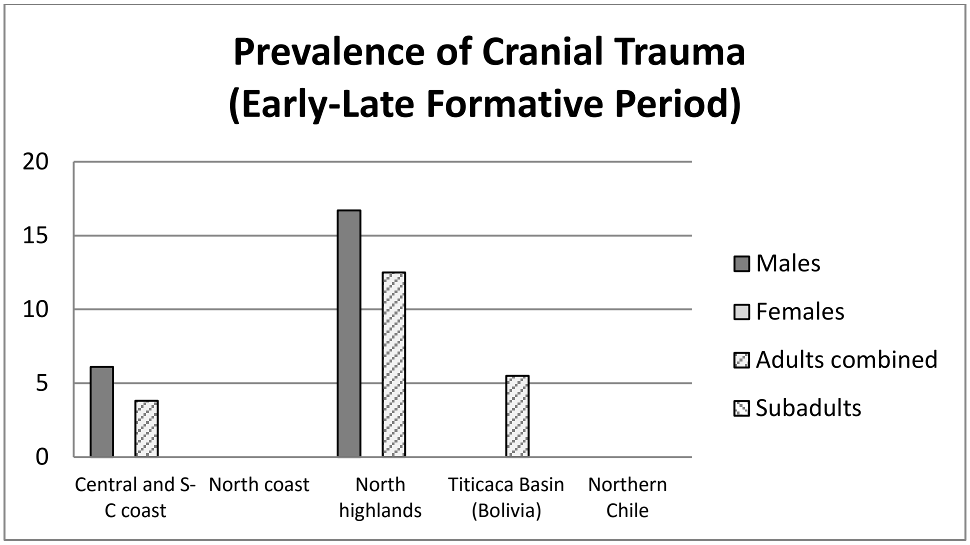

Figure 6.1: Prevalence of Cranial Fractures Found in Different Andean Regions during the Early-Late Formative Period

6.1.5 Conclusion: Violence during the Early-Late Formative Period

The available data indicate that the prevalence of malintent trauma on the central coast during the Early-Late Formative period did not exceed 10% and therefore the levels of violence were very low. Violence was apparently restricted to isolated cases of intragroup violence (male-male physical confrontations). The situation was similar to what was experienced in other Andean regions (north coast, north highlands the Titicaca Basin, and northern Chile), although it is possible that violence on the central coast was less intense than in the other three areas, judging by the lack of perimortem trauma on the central coast and the possible cannibalism cases in the north of Peru. Thus, it seems that individuals on the central coast enjoyed a more peaceful way of life than individuals in other regions.

6.2 Transition to the Early Intermediate Period (Final Formative-EIP A)

6.2.1 Violence in Tablada de Lurín

As was presented in Chapter 5, the prevalence of malintent trauma in Tablada de Lurín was very high in males (65.5%) and moderate in females (25%). Only one case of malintent trauma in a subadult (a female adolescent) was found. Using a conservative approach (the “above the hat brim line” criterion), the prevalence of malintent trauma was reduced to 25% in males, while the other two stayed the same (25% and 6.3%).

Not only did males and females differ in their rates of malintent trauma, but also in the location of the lesions. The pattern of cranial trauma found at the site (mostly antemortem fractures, affecting specially the anterior/facial area of the male skulls and the rear of the female crania) is consistent with male physical conflict resolutions, ritual battles, and/or warfare (ambush/raiding/female abduction and traditional battles). The presence of weapons and perimortem weapon-related trauma on at least one male individual of the sample (an old male with mace fractures and possibly a point embedded in T12) suggests an association of the site with traditional battles. Another perimortem weapon-related trauma case was found at the site: a teenage girl that was part of the sample (see description in Chapter 5 and the discussion bellow) and an isolated female skull found by the PATL-PUCP project showing three small triangular penetrating wounds on the occipital, and a non-penetrating wound, possibly made by the same weapon, on the upper part of the left parietal.

If the individuals of Tablada were engaged in warfare, why did only one old male and two females show perimortem weapon-related trauma? Females and old males are not usually combatants in war. It is possible though, that the male (buried with a spear-thrower) did participate and died in battle. It is also possible that the male individuals buried in the cemetery (many of them demonstrating antemortem skull trauma) represent the survivors of such encounter(s). Mortality in battles could have been low, or the dead soldiers could have been buried (or left) near the battlefield. However, the second hypothesis is not supported by the male:female ratio and age cohort distribution found by Tomasto in the site (73 males/probable males, most of them, young adults vs. 61 females/probable females, equally distributed between young and middle adults) and that my sample replicated in a smaller scale. If dead combatants were not buried with the other members of their community, a greater proportion of females (and fewer young males) would have been expected. It is more likely that the poor preservation of a great part of the osteological collection of the site is hiding more cases of perimortem trauma.

However, the low lethality facial fractures (especially in the nasals) in males are more likely produced in face-to-face confrontations, including physical conflict resolutions. Thus, the type of violence experienced by the Tablada males seems to have been a mix of intragroup (conflict resolutions?) and intergroup (warfare) violence.

Females, on the other hand, seem to have been victims of other types of violence. The location of the non-fatal injuries on the back of the skull have been interpreted as the result of raiding and abduction (see Chapter 2 for further discussion). It is possible that this practice was present at the beginnings of the EIP in Lurín, related to warfare. However, the female adolescent represents a special case. The number of fatal wounds to the head (and possibly in the thorax), the mutilation of the forearms, and the destruction of the face implies high levels of violence. Moreover, the presence of an antemortem fracture on one of the ribs may be related to a prior violent event. The prone position of the body, the simple grave with no offerings, and the isolated location of the burial with respect to the other tombs of the cemetery suggest that this female was a victim of sacrifice. However, the amount of maltreatment that she suffered has not been reported in other sacrifices of Andean females. Moreover, Andean sacrifices are usually associated with massive sacrifices of prisoners, the construction, remodeling, or abandonment of architecture, as offerings to long ago abandoned ceremonial mounds, or as accompanying retainers in high status burials (see for example Barreto 2012; Eeckhout and Owens 2008; Vega-Centeno et al. 2006; and Verano 1995, 2001a, 2008a, 2008b, 2013, 2014a). Only Capac Hucha sacrifices, (the Inca ritual that involved the sacrifice of children) differ from this pattern, as they were located in special landmarks such as peaks and volcanos. Even in these contexts, the sacrificed body was not badly damaged (e.g. Ceruti 2003; Reinhard 1992, 1997; and Schobinger 2001, 2003). This was not the case of the severely injured Tablada adolescent, who was found in the middle of the *lomas*, in the outskirts of the cemetery. It is possible then, that this female was killed in a non-sacrifice context, possibly as a capital punishment or a captive killing. On the other hand, the isolated female skull with penetrating injuries discovered in the same sector of the cemetery could have been a trophy head.

6.2.2 Other Early Intermediate Period A Sites of the Central Coast

In the EIP A cemetery of Villa El Salvador, Pechenkina and Delgado (2006) reported 6 out of 30 males (20%) and 3 out of 31 females (9.7%) with cranial fractures. In another independent study of the human remains from the site, including (all? some?) individuals that Pechenkina analyzed, Vradenburg recognized ten adult males (52.6%) and one adult female (5.9%) with cranial fractures, one of them, perimortem. Likewise, he reported one adult male and one adult female from a *cista* burial of Tablada de Lurín (the type of burial which came immediately after the burial pits cemetery), with antemortem compression fracture in the cranium. According to the author, the injuries could have been produced by a mace, and in face-to-face confrontations (Vradenburg 2001:Table 24). No evidence of perimortem cranial trauma was found in the *cistas* that Balbuena (1996) excavated, included the one that Vradenburg analyzed.

Although no prevalence data were provided, Altamirano and Jave (2013) reported circular depressed fractures of the skull and parry fractures at the site of Cerro Punta Blanca (Lurín Valley). The combined data of Tablada de Lurín (burial pits) and Villa El Salvador[100] resulted in a prevalence of cranial trauma of 28.9% for adult males, 12.8% for adult females, and 6.3% for subadults (7.4%, 0%, and 6.3% respectively, when only perimortem trauma is considered). The difference in the prevalence of cranial trauma between adult males and females was not statistically significant (odds ratio = 2.77 – 95% CI 0.86-8.94). The high levels of violence experienced by Tablada males (of possibly highland roots) was also visible (although in an apparent lesser manner) on the men of Villa El Salvador, and on the people in Cerro Punta Blanca. Where these groups opponents or allies in battle? That question cannot presently be answered.

[100] As it was not clear if the difference in the prevalence found by Pechenkina and Vradenburg corresponds to inter-observer differences or to different sample composition, I used Pechenkina's data, as it is the larger of the two samples. If it is assumed that Vradenburg identified cranial trauma that Pechenkina did not, the prevalence of cranial trauma in males would rise to 33.3%.

6.2.3 Malintent Trauma in Final Formative-EIP A Samples from Other Regions

Comparative osteological data from other Final Formative or EIP A sites are only available for two sites with Salinar contexts of the north coast: Puémape (Gillespie 1998, Pezo 2010) and Cerro Oreja (studied by Lambert but published by Arkush and Tung 2013). For the first site, Gillespie observed one Salinar male with an antemortem fracture in the zygomatic process of the left maxilla, and an antemortem cut in the lateral aspect of the left orbit. Additionally, Gillespie reported a female with a possible parry fracture. An independent assessment of the same collection done by Pezo (2010) found another eight cases (all in males, including one male adolescent) of facial and vault trauma (including one possible case of perimortem trauma). It is hard to state which of these two analyses is more reliable as Pezo (2010:Figure 11) only shows pictures of two of these cases (the fracture already described by Gillespie and another case of zygomatic fracture)[101]. Pezo's research demonstrated at least one case that Gillespie failed to identify, elevating the prevalence of cranial fractures in adult males to at least 14.3%. However, it is also possible that Pezo confused some cases trauma with other (pathological or not pathological) conditions. For the purposes of this study, the prevalence of malintent fractures was calculated to be 35.7% in adult males (the average of the prevalences provided by the two studies).

At Cerro Oreja, five (33.3%) Salinar individuals presented some kind of skull fracture. When the data of both north coast sites were combined, a prevalence of 28.6% of cranial fractures in adults of the beginnings of the EIP is calculated, slightly higher than the combined data (not counting the *cistas* of Tablada de Lurín) from the central coast (20.8%).

Another collection that provides data for cranial trauma is Kea Kollu Chico (Island of the Sun, Bolivian Titicaca Basin), presented by Torres-Rouff (2013). Torres-Rouff found two males (25%) and two females (20%) with antemortem trauma, affecting especially the

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[101] Pezo (2010) also reported a headless individual with a projectile injury in the right humeral head. However, the picture accompanying the description does not clearly show that lesion.

nasal and frontal bones. Conversely, no cases of cranial trauma were found by Blom and Bandy (1999) at the site of Chiripa (Titicaca Basin, Bolivia). Again, the prevalence of cranial trauma in this region resembles what was found on the Peruvian central coast.

There is evidence that violence was slightly higher on the south coast than in the other regions. Tomasto (2009) reported a prevalence of 33% of malintent trauma in Paracas individuals (most of them, Late Paracas) of the Palpa Valley, while Vega and Dulanto (2013) presented three male individuals of Karwa (Late Paracas), all of them with signs of a violent death. Trophy heads have been also reported for the Paracas period (Verano 1995).

Additional comparative data are available from the site of Chongos (Pisco Valley, south coast), which was analyzed by Dietz (2009). He presented two cases of unhealed cuts in the vault of two males (17-19 and 50-60 yrs.), a healing fracture in the mandible of a child (4-5 yrs.), and an unhealed greenstick fracture in the crania of another young child (1-2 yrs.) that according to the author could be a consequence of the active cranial deformation. Unfortunately, prevalence of cranial trauma could not be calculated from these data, since the exact number of individuals without a skull was not stated, although it seems that the number of headless individuals was high.

Finally, in the Azapa Valley (northern Chile), three male individuals were found with multiple perimortem injuries and buried together in the same pit (Standen et al. 2009, 2010), resembling the findings of the Formative site of Karwa (Peruvian south coast). The data of skull fractures of all these samples are summarized in Table 6.3 and Figure 6.2.

Table 6.3: Prevalence of Cranial Fractures Found in Different Andean Regions during the Final Formative and EIP A

			Prevalence of Cranial Trauma			
Site and Region	**Culture/ Phase**	**Reference**	**Males**	**Females**	**Adults combined**	**Subadults**
Tablada de Lurín (burial pits) (central coast)		This study	65.5% (5/8)	25% (2/8)	43.8% (7/16)	6.3% (1/16)
Tablada de Lurín (*cista* burials) (central coast)		Vradenburg 2001	9.1% (1/11)	10% (1/10)	9.5% (2/21)	-
Villa El Salvador (central coast)		Vradenburg 2001	52.6% (10/19)	5.9% (1/17)	30.6% (11/36)	-
Villa El Salvador (central coast)		Pechenkina and Delgado 2006	20% (6/30)	9.7% (3/31)	14.8% (9/61)	-
Puémape (north coast)	Salinar	Gillespie 1998*	7.1% (1/14)	0% (0/8)	4.3% (1/23)	0% (0/13)
Puémape (north coast)	Salinar	Pezo 2010*	57.1% (8/14)	0% (0/3)	47.1% (8/17)	9.1% (1/11)
Cerro Oreja (north coast)	Salinar	Lambert 2011 (cited by Arkush and Tung 2013)	?	?	33.3% (5/15)	?
Palpa (south coast)	Early-Late Paracas	Tomasto 2009 (cited by Arkush and Tung 2013)	?	?	25% (5/20)	-
Karwa (south coast)	Late Paracas	Vega and Dulanto (2013)	100% (3/3)	-	100% (3/3)	-
Chiripa (Titicaca Basin, Bolivia)	Tiwanaku III	Blom and Bandy 1999*	-	0% (0/1)	0% (0/1)	-
Kea Kollu Chico (Titicaca Basin, Bolivia)	Bolivian Middle-Upper Formative	Torres-Rouff 2013	25% (2/8)	20% (2/10)	22.2% (4/18)	-
Azapa (northern Chile)	Late Formative	Standen et al. 2009, 2010	100% (3/3)	-	100% (3/3)	-

* Prevalence calculated based on data presented in that study. Only observable cases were included.

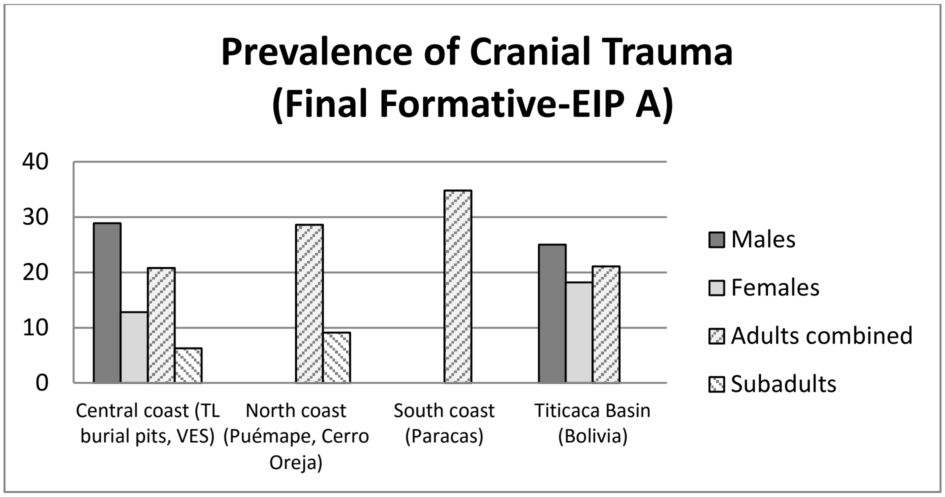

Figure 6.2: Prevalence of Cranial Fractures Found in Different Andean Regions during the Final Formative and EIP A

6.2.4 Comparison with the Early-Late Formative Period

The prevalence and pattern of violence experienced in the central coast during the beginnings of the EIP greatly differs from what was seen in the previous period. Contrasting with the Formative period, in which violence seemed to be very low or even non-existent (at least at the osteological level), The EIP A showed a shift of the level of violence (including lethal episodes). The difference in the prevalence of cranial trauma between males from the EIP A and the Formative period was statistically significant (odds ratio = 5.03 – 95% CI 1.04-24.19). However, the difference between females from both periods was not significant (odds ratio = 6.13 – 95% CI 0.33-114.05).

6.2.5 Conclusion: Violence during the Transition to the EIP

The available data for the central coast shows that the prevalence of cranial trauma in males of the Lurín Valley was moderate (or even high in some sites), probably ranging between 20-40% and associated with episodes of warfare (including traditional battles) and intragroup violence (conflict resolution?). The prevalence of cranial trauma in females (12.8%) was lower than in males (28.9%) and was probably related to raiding and female abduction (associated with warfare). Special violent treatment of females as possible victims of trophy taking and captive killing/capital punishment was also detected. With the exception of one female adolescent, subadults seemed to have been spared from violence. It seems that in the period in which the burial pits where replaced by the *cistas* as the form of interment in Tablada de Lurín, the levels of violence dropped. The comparison of the prevalence of cranial trauma in adults showed similar levels of violence between the central and the north coast and the Titicaca Basin in Bolivia. However, it is not clear if the kind of violence was the same in all these areas, although the absence of perimortem trauma and the location of the lesions in females (mostly in the anterior part or the skull) suggests that people of the Titicaca Basin may have faced mostly non-deadly face-to-face encounters. Males of the Azapa Valley in Chile possibly were victims of an ambush.

6.3 Early Intermediate Period B

6.3.1 Violence in Cerro Culebra

The prevalence of malintent trauma in adults from Cerro Culebra was high. Malintent trauma was detected in 50% of the males and females, and 4.8% of the subadults. When only cranial fractures are considered, the prevalence is 50% in males, 40% in females, and 4% in subadults (50%, 20%, and 3.7% respectively, using the "hat brim line" criterion). Strong sex differences in the location, lethality, or MNEv of the lesions were not found. However, both males and females presented lesions on the front of the skull. Males also showed lesions in the rear and females in the upper-anterior and upper-posterior part of the parietals. However, it is possible that the poor preservation of the remains and the small number of individuals (especially males) could be altering the prevalence of malintent trauma in this population.

The nature of the violence that caused these lesions is unclear. The combination of non-lethal lesions on the anterior and posterior aspect of the skull could be related to face-to-face confrontations, ritual battles, and warfare. However, the absence of perimortem trauma, weaponry, and fortifications in the area do not support the conclusion that they were caused by traditional warfare. No case of clear multiple events of malintent trauma have been detected since all but one individual presented isolated fractures affecting a single part of the skull. Although one of the males presented four well identified fractures on the anterior part of the skull, they could have been produced in a single event. Thus, a strong association of these lesions to ritual battles could not be established. It is possible then, that the more likely cause for these wounds was face to face confrontation.

The cranial fracture of the subadult must be highlighted, as it is the first suspected case of child abuse on the central coast. The age of the infant (0.5-1 year) makes an accidental cause unlikely (Lewis 2007, 2014). However, it is also possible that this infant was also the victim of a raid.

6.3.2 Other Early Intermediate Period B Sites of the Central Coast

There are no available data for other sites of the central coast of the same time period.

6.3.3 Malintent Trauma in EIP B Samples from Other Regions

The data gathered from different studies of human remains from the north coast (see Table 6.4) showed that the prevalence of skull fractures was between low and moderate in adults (17.6% in males, 26.7% in females, 20.5% adults combined) and very low in subadults (3.7%)[102]. Lesions in males were located mostly on the frontal or facial bones both in males and females (e.g. Dillon 2015; Phillips 2009; Verano et al. 2008). However, it must be noted that this prevalence does not include perimortem trauma in the many cases of sacrificed individuals (especially male soldiers[103]). Interpersonal violence among the Moche is much higher in this group than in non-soldier individuals buried in Moche cemeteries such as Pacatnamú, El Brujo, and San José de Moro (Castillo 2014; Phillips 2009; Verano 2014a). The presence of sacrificed soldiers, and the rich iconographic information contained in the Moche ceramics suggest that war and violence (whether real or ritual) was present among the Moche (Castillo 2014; Verano 2014a). Thus, the prevalence of cranial trauma is clearly underestimating the presence of violence on the north coast.

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[102] The difference of the prevalence of adult skull trauma between the central and the north coast was almost statistically significant (odds ratio = 2.90 – 95% CI 0.95-8.86).

[103] Their identification as soldiers have been proposed by Phillips (2009) and Verano (2014a) based on the presence of antemortem violent trauma (i.e. skull, parry and boxer`s fractures).

On the south coast, prevalence of cranial trauma in adults was very low to low (males 10.9%, females 6.1%, adults combined 8.2%) and very low in subadults (2.3%). In the Las Trancas Valley, all the cranial fractures were antemortem (Kellner 2002). While there were no cases of cranial trauma in the Palpa Valley collection that Tomasto (2009) analyzed, she reported two cases of parry fractures and one case of post-cranial arrow wound. Interestingly, she also found a child (5-6 years) with a depressed fracture on the rear of the skull and two possible cases of child abuse (femoral fracture in a 6-12 month-old and rib fractures in different stages of healing in an 8-16 month-old). Perimortem parry fractures was also present in the Acarí skeletal sample studied by Howell (2007). The difference of the prevalence of adult skull trauma between the central and the south coast was statistically significant (<u>odds ratio = 8.44 – 95% CI 2.34-30.41</u>). Nevertheless, as was the case of the Moche, the prevalence of cranial trauma seems to underestimate the presence of violence in the south coast. Apparently war was also present among the Nazca, as the practice of decapitation/trophy-taking suggests (e.g. Baraybar 1987; Howell 2007; Kellner 2002, 2009; and Verano 1995).

The combined data of Conchopata, in the Ayacucho region (a male with a healed left zygomatic fracture, presented in Tung 2007, 2012b) and Wata of the Cuzco region (Andrushko 2007) gave a prevalence of 13.6% of cranial fractures in adults for the southern highlands. For northern Chile, the prevalence of skull trauma in adults did not exceed 10% (Costa et al.1998; Lessa and Mendonça 2004; Torres-Rouff and Costa 2006). Interestingly, at both sites (Solcor 3 and Toconao Oriente) the female prevalence was higher than the male prevalence of cranial trauma (Table 6.5). Most of the fractures were located in the nasals in both males and females from Solor 3 (Torres-Rouff and King 2014).

The difference of the prevalence of adult skull trauma between the central coast and the south highlands was close to being statistically significant (odds ratio = 4.75 – 95% CI 0.95-23.85), while the difference with northern Chile was significant (<u>odds ratio = 10.56</u>

– 95% CI 3.15-35.41)[104]. The data for skull fractures in all these samples are summarized in Figure 6.3.

6.3.4 Comparison with the Beginnings of the EIP

The comparison with the previous time period showed that the prevalence of cranial fractures on the central coast was higher in the EIP B. Although no significant difference was found in the prevalence of cranial fractures in males with the earliest part of the EIP (odds ratio = 3.08 – 95% CI 0.39-24.32), the female and combined adult differences were statistically significant (odds ratio = 4.78 – 95% CI 1.04-21.99 and odds ratio = 3.33 – 95% CI 1.03-10.80, respectively).

The pattern of trauma found in the EIP B was different from the EIP A. In the EIP A malintent trauma affected sexes in different ways (males more affected than females, males more affected in the frontal aspect of the skull, females on the back of the skull) and tended to be more violent. No clear pattern was found in the EIP B and no lethal trauma was observed. Although it is possible that violence in the EIP A and B was of different origin, the small size of the EIP B collection (especially of males) does not allow us to formulate definitive conclusions.

[104] Two independent studies (Costa et al. 1998 and Lessa and Mendonça 2004) were done on the Solcor 3 material. For statistical calculations, both results were averaged here, resulting in an estimation of 6.3% (2 out of 32) of cranial fractures in adults from the site.

Table 6.4: Prevalence of Cranial Fractures Found on the Central and North/North-Central Coast during the EIP B

			Prevalence of Cranial Trauma			
Site and Region	**Culture/ Phase**	**Reference**	**Males**	**Females**	**Adults combined**	**Subadults**
Cerro Culebra (central coast)	Middle Lima	This study	50% (2/4)	40% (4/10)	42.9% (6/14)	4.8% (1/21)
Cerro Oreja (north coast)	Gallinazo-Early Moche	Lambert 2011 (cited by Arkush and Tung 2013)	?	?	19.2% (14/73)	?
Huaca de la Luna (various areas) (north coast)	Moche	Anderson 1998* Delabarde 2008* Escudero 2004* Millones 2000*, 2004* Uceda et al. 2003*	0% (0/7)	33.3% (1/3)	10% (1/10)	0% (0/6)
Huaca de la Luna- Plaza 3A (north coast)	Moche	Phillips 2009	18.6% (8/43) (10 yrs+)	-	18.6% (8/43) (10 yrs+)	-
Huaca de la Luna- Plaza 3C (north coast)	Moche	Phillips 2009* Verano et al. 2008*	20% (6/30)	-	20% (6/30)	0% (0/5)
Sipán (north coast)	Moche	Verano 1997*	0% (0/1)	-	0% (0/1)	-
El Brujo (north coast)	Moche	Phillips 2009*	? (5/?)	0% (0/?)	31.8% (7/22)	12.5% (1/8)
Huacas Sta Clara and Gallinazo (north coast)	Virú/Gallinazo	Dillon 2015	0% (0/2)	25% (1/4)	16.7% (1/6)	0% (0/5)
El Castillo (north-central coast)	Virú/Gallinazo	Gagné 2009*	50% (1/2)	0% (0/5)	14.3% (1/7)	0% (0/3)
El Castillo (north-central coast)	Moche III	Phillips 2009*	-	66.7% (2/3)	66.7% (2/3)	-

* Prevalence calculated based on data presented in that study. Only observable cases were included.

Table 6.5: Prevalence of Cranial Fractures Found in the South Coast, South Highlands, and Northern Chile during the EIP B

			Prevalence of Cranial Trauma			
Site and Region	**Culture/ Phase**	**Reference**	**Males**	**Females**	**Adults combined**	**Subadults**
Las Trancas Valley (south coast)	Nazca	Kellner 2002	12.8% (5/39)	8.3% (2/24)	11.1% (7/63)	0% (0/18?)
Palpa Valley (south coast)	Early-Late Nazca	Tomasto 2009*	0% (0/7)	0% (0/9)	0% (0/16)	3.8% (1/26)
Nasca and Taruga (south coast)	Nazca	Tung and Schreiber 2010 (cited by Arkush and Tung 2013)	?	?	5.3% (1/19)	?
Conchopata (south highlands)	Huarpa	Tung 2007, 2012b	100% (1/1) (15 yrs+)	0% (0/4) (15 yrs+)	9.1% (1/11) (15 yrs+)	-
Wata (south highlands)		Andrushko 2007	?	?	18.2% (2/11) (including 3 subadults)	? (?/3)
Solcor 3 (northern Chile)	Pre-Tiwanaku	Costa et al. 1998	?	?	9.1% (3/33)	-
Solcor 3 (northern Chile)	Pre-Tiwanaku	Lessa and Mendonça 2004*	0% (0/17)	7.7% (1/13)	3.3% (1/30)	-
Solor 3 (northern Chile)	Late Formative-Middle Period	Torres-Rouff and King 2014	?	?	10% (5/50) (may include children and teenagers)	0% (0/?)
Toconao Oriente (northern Chile)		Torres-Rouff and Costa 2006	1.7% (1/60)	10.3% (4/39)	5.1% (5/99)	-

* Prevalence calculated based on data presented in that study. Only observable cases were included.

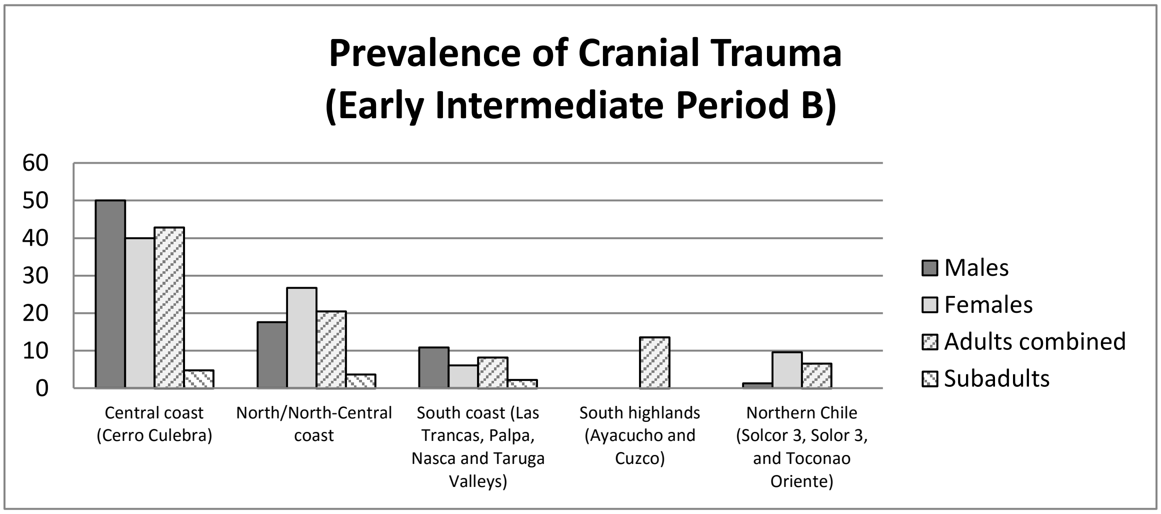

Figure 6.3: Prevalence of Cranial Fractures Found in Different Andean Regions during the EIP B

6.3.5 Conclusion: Violence during the EIP B

Based on the results of Cerro Culebra, the only Early-Middle Lima skeletal collection available for study, it seems that the levels of violence on the central coast were high in adults (50% in males and females, both sexes presenting similar patterns of non-lethal fractures concentrated in the anterior part of the skull in females and in the anterior and posterior part in males). This period also marks the appearance of the first case of possible child abuse reported for the central coast. Although the nature of the violence experienced in this population is not clear, the most likely explanation is confrontations in which both males and females were facing their attackers.

The levels of non-lethal violence were higher than in the previous period, and in other Andean regions during the same time period. While it is very likely that war (whether real or ritual) was part of life on the central coast during the transition to the EIP, and during the EIP in the north and south coasts, there is not strong evidence to support its presence among the Lima, although it could have been present in the form of raiding. However, it must be acknowledged that this interpretation is limited by the small number of individuals from the central coast.

6.4 Middle Horizon 1-2

6.4.1 Violence in Huaca 20 and Copacabana

The data presented in Chapter 5 showed that the prevalence of malintent trauma was similar in males of Huaca 20 (Maranga complex) and females of both sites (~25-35%), but was higher in Copacabana males (75%). When the "hat brim line" criterion was applied, the prevalence dropped slightly in some cases (23.3% in males, 22.7% in females, and 3.4% in subadults from Huaca 20 and 50% in males from Copacabana). Overall, the prevalence of malintent trauma in both Late Lima samples were 33.3% in males, 30.4% in females, and 4% in subadults. Although most of the malintent trauma was located on the cranium, there were also two cases of parry fractures (one male and one female from Huaca 20). Nonetheless, it is possible that poor preservation could be influencing the calculation of prevalence, as many individuals presented the facial area too fragmentary to be assessed.

The traumatic lesions were concentrated on the anterior part of the skull in both sexes (especially in facial bones of males and the superior half of the frontal bone in females). However, males from Huaca 20 also presented a concentration of fractures on the rear of the skull. The prevalence of malintent trauma indicates that around one-third of the Late Lima adults were involved in violent confrontations. The location, number, and lethality of the fractures suggest that these confrontations were rarely deadly or repetitive[105]. However, it seems that individuals in Copacabana were exposed to more violent encounters than their Huaca 20 counterparts. Male-male physical confrontations (including physical conflict resolutions) could explain (at least partially) the frontal pattern in males of both sites. However, the presence of different cases of lesions on the occipital in males of Huaca 20 could be also be a consequence of raiding. The kind of

[105] Just one male from each site, and the only female from Copacabana exhibiting malintent trauma, presented evidence that indicated the exposure of the individual to at least two different violent events. Another male from Copacabana (individual B11 E1) could have faced more than one violent encounter. Although all his cranial fractures were catalogued as healed, the presence of porosities in the surface of one of the fractures (contrasting with the almost smooth surface of the others) could imply that this individual suffered at least two episodes of violence, although the difference on the bone reaction could also correspond to lesions produced in a single event, in which the more severe fracture took more time to heal.

violence demonstrated by the females is more difficult to interpret. Most of the lesions of females were also located in the anterior part of the skull, suggesting that these females were facing their attacker. However, the virtual absence of fractures in the back of the skull of females of both sites does not exclude the presence of female abduction in the Late Lima populations.

The only subadult individual showing malintent trauma in the Late Lima sample is a female adolescent (16-19 years) from Huaca 20 with a small healed fracture in the frontal bone, indicating that she suffered similar violent events as experienced by the adult females.

6.4.2 Other Middle Horizon 1-2 Sites of the Central Coast

The comparison with other Late Lima sites showed that the prevalence of cranial trauma in females was low (10-20%), and that the lesions were mostly non-lethal. In the case of males, the average prevalence of cranial trauma suggests that the levels of violence in the central coast were moderate, with around one-quarter of the male adult population affected. Although the general prevalence of Late Lima cranial trauma was higher in males than in females (25.4% vs. 16.1%), the difference was not statistically significant (odds ratio = 1.78 – 95% CI 0.71-4.42).

It seems that males in Copacabana could have been more exposed to violence than males of other Late Lima sites. However, no statistically significant difference was found (odds ratio = 3.38 – 95% CI 0.61-18.82) between Copacabana and the other sites. No case of cranial trauma was reported in subadults from other MH 1-2 sites (Table 6.6).

Violence in the Late Lima populations was mostly non-lethal in both males and females. Only one female from Cajamarquilla (Conjunto Tello) presented an antemortem fracture in the frontal bone (close to the right orbit) (Fierro c.1998). Álvarez (2013) reported facial and vault antemortem fractures both in males and females. Perimortem trauma only appeared in association with human sacrifices in sites such as Huaca Pucllana, Huaca San Marcos, and Cajamarquilla (e.g. Barreto 2012, Vega 2015a) and in some isolated cases from Huaca 20 and Catalina Huanca (Álvarez 2013), located mostly on the vault. In total (not counting perimortem trauma associated with human sacrifice), lethal trauma was found in 4% of the males, 1% of the females, and 4.2% of the subadults of the Late Lima individuals.

The presence of rib fractures in an initial stage of healing found in a sacrificed female from Huaca Pucllana (Barreto 2012:115) and the sacrificed male from Cajamarquilla (Vega 2015a:142) suggests that some victims faced physical violence at least 12 days before their killings (see Table 2.1), a practice already reported for Moche combatants (Verano 2014a). Moreover, slings associated with some sacrificed males were found in the two afore-mentioned Late Lima sites, possibly implying that these males were warriors or non-combatants captured by Late Lima warriors. It is very likely that the trophy heads that Jijón y Caamaño (1933, 1949) and Paredes (1998, 1999) found in the Maranga complex belonged to the MH 1, which lends support to the idea that part of the Late Lima population was involved in warfare.

6.4.3 Malintent Trauma in Middle Horizon 1-2 Samples from Other Regions

When the prevalence of cranial trauma from different regions is compared, it is evident that the prevalence of cranial trauma in Late Lima populations is one of the highest of the central Andean region (21% in adults), only slightly surpassed by the Wari from the south highlands (26.8% in adults) (Figure 6.4). Coincidentally, the central coast and the south highlands were the only regions in which subadults showing cranial trauma were reported from this time period (Tables 6.6 and 6.7). The prevalence of lethal trauma in adults is also similar in both regions (2.5% in the Late Lima samples, 3.0% in the south highlands samples). The pattern observed in different sites of the south highlands indicates that violence was expressed differently throughout that region. There were sites such as Pikillacta (Cuzco) and Turpo (Andahuaylas) where cranial fractures (all of them antemortem) where exclusively found in males, affecting mostly the frontal aspect of the skull (Kurin 2012, 2014; Verano 2005c). However, lethal violence was also present in the Cuzco area, judging from the presence of a case of perimortem trauma (a trophy head) reported by Andrushko and Torres (2011). More cases of trophy heads were found in Ayacucho (the Wari core) and Arequipa (e.g. Tung 2003, 2008a, 2014b).

In the Arequipa region, cranial trauma was found in both males and females. Tung (e.g. 2003, 2012b, 2014b) concluded that the pattern of trauma found in Beringa (males with antemortem lesions in the anterior and posterior part of the skull, females with most fractures on the rear) was consistent with raiding. The cases observed in La Real (with males with a concentration of antemortem lesions on the anterior part of the cranium) could have been the consequence of *tinku* or other variants of ritual conflict resolutions.

In the Nazca-Wari sites the prevalence of cranial trauma was also mostly non-lethal, especially affecting males. For the Las Trancas Valley Kellner (2002) reported a prevalence of 11.3% of cranial trauma in adults (16.7% in males, 6.8% in females, all of them non-lethal and mostly located in the anterior part of the frontal and parietals). Kellner also reported the presence of trophy heads, although fewer than in the previous Late Nazca period (which registered the highest rate of trophy head of the Nazca) (Kellner 2002). My study on Late Nazca-Wari individuals from Miraflores 3A (Pisco Valley) showed a prevalence of 25% of trauma in adults (33.3% in males, including one lethal fracture, and 9.1% in females) (Vega 2004). Tomasto did not find any evidence of cranial trauma in the seven females that she studied from the Palpa Valley (Tomasto 2009) (Table 6.7). Although the prevalence of cranial trauma in females from the central coast was higher than in females from the south coast (16.1% vs. 6.5%), no statistically significant difference was found (odds ratio = 2.78 – 95% CI 0.80-9.59). The prevalence of cranial trauma in males from both regions was similar (25.4% in the central coast, 20.3% in the south coast).

In contrast, very low rates of violence (0-10%) are apparent in the north-central and north coast (mostly Late Moche and Sicán territories) and in the Moquegua-Titicaca-Bolivian Altiplano region (Tiwanaku territories) (Tables 6.8 and 6.9). Most of the cases of cranial trauma from the north coast were antemortem fractures to the nose (mostly on males) (e.g. Klaus 2014, Phillips 2009). The only case of cranial trauma in the site of El Castillo (Huarmey) was a male with an antemortem fracture to the frontal bone (Więckowski 2014). Among the few cases reported in the south Peru-Bolivian region, was a probable case of domestic violence (an old female with multiple fractures in to the face and rib cage) from the site of Chen Chen (Moquegua) presented by Blom and colleagues (cited by Tung 2003:231).

The difference in the sex-specific prevalence of cranial trauma was statistically significant between the central coast and the north-central coast[106] (odds ratio = 5.33 – 95% CI 1.46-19.53 in males, odds ratio = 11.01 – 95% CI 2.29-52.89 in females), the central coast and the north coast (odds ratio = 3.84 – 95% CI 1.59-9.23 in adults combined), and the central coast and the Moquegua-Titicaca-Bolivian Altiplano region (odds ratio = 5.96 – 95% CI 1.87-18.93 in males, odds ratio = 23.17 – 95% CI 2.86-187.95 in females).

In northern Chile (also a zone of Tiwanaku influence), the prevalence of cranial trauma in adults is slightly higher than in the two regions already mentioned (12.6 in males, 10.9% in females) (Table 6.9)[107]. In some sites, the majority of lesions (both in males and females) were located in the nasal or the frontal bones (Lessa and Mendonça 2006; Torres-Rouff and Costa 2006; Torres-Rouff and King 2014), while in other the majority of lesions in males were located in the parietal bones and females presented a combination of anterior and posterior lesions (Fouant 1984). The general prevalence of cranial trauma in the site was higher than in the preceding period (Late Formative-EIP) which made Torres-Rouff and Costa (2006) conclude that violence had increased (albeit slightly) during the MH in the San Pedro de Atacama region. The difference of the prevalence of cranial trauma in males was statistically significant between the central coast and northern Chile (odds ratio = 2.36 – 95% CI 1.17-4.75).

It is difficult to assess the prevalence of cranial trauma in the Chachapoyas region (north highlands), as the available data (Jakobsen et al. 1986-1987) only present results of

[106] Although technically located in the central coast, Ancón was included in the north-central coast sample as it was culturally closer to this region than to the Late Lima during this period.

[107] Although different studies about Solcor 3 have been published (e.g. Costa et al. 1998; Lessa and Mendonça 2004; Torres-Rouff and Costa 2006; and Torres-Rouff et al. 2005), I used Torres-Rouff and Costa 2006 and Torres-Rouff et al. 2005 for the calculation of the general prevalence of cranial trauma in northern Chile, as their studies present the largest number of individuals.

antemortem fractures, and mentioned the presence of a total of 11 individuals with perimortem trauma (all of them males) for the whole collection (including sites of later periods). In the south-central coast, no case of cranial trauma was found, although the sample is limited to five adults from Huaca Malena (see Chan 2011). Finally, Lund and colleagues (2013) described an adult with two perimortem traumatic lesions on the skull. This individual also presented a farming tool embedded in the last cervical vertebrae and one healing rib fracture.

Table 6.6: Prevalence of Cranial Fractures Found at Different Late Lima Sites

			Prevalence of Cranial Trauma			
Site and Region	**Culture/ Phase**	**Reference**	**Males**	**Females**	**Adults combined**	**Subadults**
Huaca 20 (central coast)	Late Lima	This study	23.3% (7/30)	22.7% (5/22)	23.1% (12/52)	3.4% (1/29)
Copacabana (central coast)	Late Lima	This study	50% (3/6)	16.7% (1/6)	33.3% (4/12)	0% (0/3)
Cajamarquilla-Tello (c. coast)	Late Lima	Fierro c.1998*	0% (0/3)	33.3% (1/3)	16.7% (1/6)	0% (0/1)
Cajamarquilla-Villar Córdova (central coast)	Late Lima	Vega 2015a	0% (0/1)	-	0% (0/1)	-
Huaca Pucllana (central coast)	Late Lima	Barreto 2012*	25% (3/12)	5% (1/20)	12.5% (4/32)	0% (0/8)
Huaca San Marcos	Late Lima	Barreto 2012*	-	-	-	0% (0/1)
Catalina Huanca (central coast)	Late Lima	Álvarez 2013*	27.3% (3/11)	20% (1/5)	25% (4/16)	13.3% (2/15)

* Prevalence calculated based on data presented in that study. Only observable cases were included.

Table 6.7: Prevalence of Cranial Fractures Found in the South Coast and South Highlands during the MH 1-2

			Prevalence of Cranial Trauma			
Site and Region	**Culture/ Phase**	**Reference**	**Males**	**Females**	**Adults combined**	**Subadults**
Las Trancas V. (south coast)	Wari	Kellner 2002	16.7% (6/36)	6.8% (3/44)	11.3% (9/80)	0% (0/17?)
Palpa Valley (south coast)	Wari	Tomasto 2009*	-	0% (0/7)	0% (0/7)	0% (0/7)
Miraflores 3A (south coast)	Late Nazca-Wari	Vega 2004	33.3% (4/12)	9.1% (1/11)	25% (6/24)	0% (0/20)
Timbambo and Achil (NE highlands)		Jakobsen et al. 1986-1987	≥12.8% (AM: 5/39, PM: ?)	5.9% (1/17)	≥9.1% (AM: 6/66, PM:?)	0% (0/7)
Conchopata (south highlands)	Wari	Tung 2012b	28.6% (4/14) (15 yrs+)	24% (6/25) (15 yrs+)	22.7% (10/44) (15 yrs+)	0% (0/39)
Ñawinpukio and Trigo Pampa (south highlands)	Wari	Tung 2014b	?	?	0% (0/5) (15 yrs+)	-
Beringa (south highlands)	Wari	Tung 2003, 2012b, 2014b	50% (5/10) (15 yrs+)	30.8% (4/13) (15 yrs+)	33.3% (13/39) (15 yrs+)	3% (1/33)
La Real (south highlands)	Wari	Tung 2003, 2012b, 2014b	41% (16/39) (15 yrs+)	19.2% (5/26) (15 yrs+)	30.8% (32/104) (15 yrs+)	6.3% (1/16)
Uraca (south highlands)	Wari	Koontz 2011 (cited by Tung 2014)	?	?	59.4% (19/32) (15+ yrs)	-
Turpo (south highlands)	Wari (MH2)	Kurin 2012, 2014	18.2% (2/11)	0% (0/5)	7.7% (2/26) (15 yrs+)	0%? (0?/10)
Cuzco region (south highlands)	Wari	Andrushko and Torres 2011	18.8% (3/16) (15 yrs+)	0% (0/16) (15 yrs+)	8.3% (3/36) (15 yrs+)	-
Pikillacta (south highlands)	Wari	Bauer and Bauer 1984 Verano 2005c	20% (1/5)	0% (0/7)	8.3% (1/12)	0% (0/1)

* Prevalence calculated based on data presented in that study. Only observable cases were included.

Table 6.8: Prevalence of Cranial Fractures Found in the North-Central, South-Central, and North Coast, and the North-Eastern Highlands during the MH 1-2

			Prevalence of Cranial Trauma			
Site and Region	**Culture/ Phase**	**Reference**	**Males**	**Females**	**Adults combined**	**Subadults**
Ancón (central coast)	Wari?	Rojas-Sepúlveda and Dutour 2009	~4.1% (2/48-50) (15 yrs+)	~3.1% (2/63-65) (15 yrs+)	3.5% (4/113) (15 yrs+)	-
El Castillo de Huarmey (north-central coast)	Wari	Więckowski 2014*	100% (1/1)	0% (0/53)	1.9% (1/54)	0% (0/12)
Huaca Malena (south-central coast)	Wari?	Chan 2011	?	?	0% (0/5)	-
Lambayeque Valley (north coast)	Middle Sicán	Klaus 2014* Sakaue 2009-2010*	?% (1/?)	0% (0/?)	0.9% (2/215) (including subadults)	?
Sicán capital (north coast)	Sicán	Baraybar and Shimada 1993* Farnum 2002*	0% (0/8)	0% (0/32)	2% (1/50)	0% (0/7)
El Brujo (north coast)	Sicán	Farnum 2002, 2006 (cited by Arkush and Tung 2013 and Tung 2014b)	?	?	7.4% (2/27)	-
Pacatnamú (north coast)	Moche V	Phillips 2009*	? (2/?)	? (2/?)	13.3% (4/30)	0% (0/2)
Huaca Sta Clara (north coast)	Tomaval	Dillon 2015	-	-	-	0% (0/6)
San José de Moro (north coast)	Lambayeque	Nelson et al. 2000	-	0% 0/1	0% 0/1	-
Timbambo and Achil (NE highlands)		Jakobsen et al. 1986-1987	≥12.8% (AM: 5/39, PM: ?)	5.9% (1/17)	≥9.1% (AM: 6/66, PM:?)	0% (0/7)

* Prevalence calculated based on data presented in that study. Only observable cases were included.

Table 6.9: Prevalence of Cranial Fractures Found in the Central Highlands, the Titicaca Basin, and Northern Chile the MH 1-2

			Prevalence of Cranial Trauma			
Site and Region	**Culture/ Phase**	**Reference**	**Males**	**Females**	**Adults combined**	**Subadults**
Carhuacoto (central. highlands)		Lund et al. 2013	100% (1/1)	-	100% (1/1)	? (?/4)
Moquegua-Titicaca Basin (Peru and Bolivia)	Tiwanaku	Blom et al. 2003 (cited by Tung 2003)	5.6% (4/72)	0.8% (1/119)	2.6% (5/191)	-
Tiwanaku (Titi-caca B., Bolivia)	Tiwanaku IV-V	Verano 2013*	0% (0/2)	0% (0/1)	0% (0/3)	0% (0/8)
Chiripa (Titicaca Basin, Bolivia)	Tiwanaku IV-V	Blom and Bandy 1999*	-	0% (0/2)	0% (0/3)	-
Juch’uypampa Cave (Bolivian Altiplano)	Tiwanaku	Arkush and Tung 2013 Tung 2014b	?	?	33.3% (1/3)	-
Azapa Valley (northern Chile)	Cabuza	Fouant 1984*	20% (1/5) (15 yrs+)	9.1% (1/11) (15 yrs+)	12.5% (2/16) (15 yrs+)	0% (0/24?)
Azapa Valley (northern Chile)	Maitas	Fouant 1984*	12% (3/25) (15 yrs+)	17.5% (7/40) (15 yrs+)	15.4% (10/65) (15 yrs+)	0% (0/55?)
Azapa Valley (northern Chile)	Tiwanaku	Fouant 1984*	0% (0/2?)	0% (0/7?)	0% (0/9?)	0% (0/9?)
Coyo Oriente (northern Chile)	Tiwanaku	Lessa and Mendonça 2006	12% (15/125)	9.9% (10/101)	11.1% (25/226)	-
Solcor 3 (northern Chile)	Tiwanaku	Torres-Rouff and Costa 2006* Torres-Rouff et al. 2005	14.3% (7/49)	9.3% (4/43)	12.0% (11/92)	-
Larache, Solcor Plaza, and Tchecar (northern Chile)	Tiwanaku	Torres-Rouff and King 2014*	?	?	17.1% (44/257) (may include subadults)	0% (0/?)

* Prevalence calculated based on data presented in that study. Only observable cases were included.

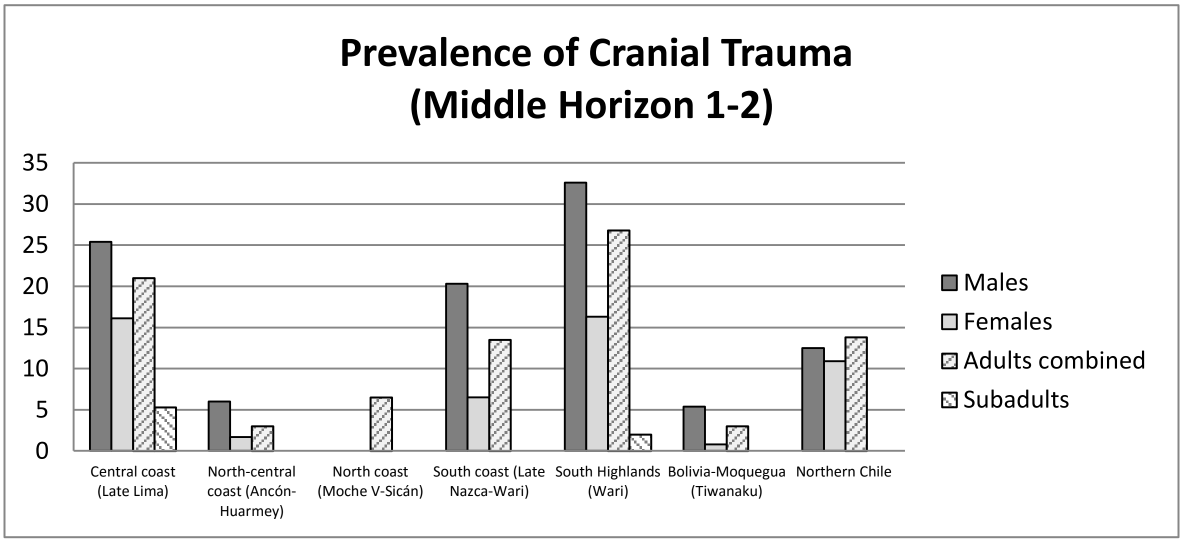

Figure 6.4: Prevalence of Cranial Fractures Found in Different Andean Regions during the MH 1-2

6.4.4 Comparison with the EIP B

There was a reduction in the prevalence of cranial trauma in adults from the previous time period, the EIP A to the EIP B (from 42.9% to 21.0%). However, this difference was not statistically significant (odds ratio = 2.82 – 95% CI 0.90-8.88), most probably due to the small size of the EIP B adult sample (n =14).

The interpretation of the evidence for the MH 1-2 is most consistent with warfare, with the presence of some cases of perimortem trauma, and possibly of some trophy taking and the sacrifice of captives. However, it is possible that raiding was experienced by both the Middle and the Late Lima societies.

6.4.5 Conclusion: Violence during the MH 1-2

The combined data from different Late Lima sites showed that the prevalence of cranial trauma was moderate (25.4%) of the males, low in females (16.1%), and very low in subadults (5.3%). It is possible that violence was more frequent in Copacabana (located in the northern extreme of the Late Lima territories) than in other sites, although the number of individuals that composed the sample is low. A few individuals from Huaca 20 and Copacabana were involved in more than one violent event. It seems that at least in

Huaca 20, low status individuals were more exposed to violence that higher status individuals.

The lethality of the fractures and location of the cranial trauma (mostly antemortem trauma to the anterior part of the skull) were the consequence of non-lethal face-to–face encounters (male-male physical confrontations? Physical conflict resolution?). However, the presence of different cases of lesions in the back of the skull suggests that some males from Huaca 20 could also have been victims of ambush or raiding. Although trauma in females was mostly located on the frontal bone (with almost no cases of trauma to the back of the skull), we cannot exclude that Late Lima women were victims of raiding, as captive women could have been brought to other communities. The presence of possibly sacrificed captives and the possibility of trophy heads suggests that the Lima were not only victims but also aggressors in warfare. The scenes engraved in the gourd fragment found in Huaca San Marcos and published by Shady and Narvaez (2000) (see Figure 3.5) could be a representation of real fights.

The comparison with other Andean regions indicated that the Late Lima suffered more violent encounters than their neighbours did. Only the Wari from the south highlands (especially from Beringa and La Real, in Arequipa) presented a higher prevalence of cranial fractures.

The comparison of the prevalence of cranial trauma suggests a reduction of violence in the Late Lima period compared with the preceding period. It is also possible that raiding was present in the Middle and the Late Lima period, but that more complicated manifestations of warfare (i.e. captive killing and trophy taking) became apparent during the MH 1. However, the small sample size from the EIP B does not allow one to make solid statements.

6.5 Middle Horizon 3-4

6.5.1 Violence in Ancón

The prevalence of malintent trauma in adults during MH 3-4 at Ancón was very high (55.6%), being observed in 80% of the males and 25% of the females, although this difference was not statistically significant (odds ratio = 12.0 – 95% CI 0.51-280.11), probably because of the small size of the sample (n = 6 for males and 5 for females). No case of malintent trauma was found in subadults. Using the "hat brim line" approach, the prevalence of malintent trauma in males dropped to 20%, but stayed in 25% in females.

It was remarkable that three out of four cases of cranial trauma in males were broken and healed noses. The other two adult cases corresponded to two adult individuals with perimortem trauma: an old female retainer with a severe blunt force lesion to the left side of the vault and a young male with a sharp-blunt trauma to the right parietal and destruction of the facial area. This male also presented possible perimortem fractures on the ribs and teeth. No cases of repetitive trauma were found. Interestingly, both individuals were possibly buried (or kept) in another location before they were buried in Ancón, judging by the absence of some bones (especially from the lower limbs) (see description in Chapter 5). It is possible that these individuals were killed in another place, either as part of a ritual or during an attack.

The location and severity of the lesions suggest that males faced both non-lethal face-to-face encounters and deadly events. The presence of weapons in some of the males' graves from this sample (especially star maces) indicates that they could have been participants in war, which could also occasionally affect females. It is also possible that war casualties (such as the two already presented examples) were buried or left close to the battle took place and the bodies recovered (months? weeks?) later to have a proper burial in the communal cemetery. However, as was the case of the Middle Lima sample, the number of individuals is too limited to make strong inferences (n = 30).

6.5.2 Other Middle Horizon 3-4 Sites of the Central Coast

There are no available data for other sites of the central coast of the same time period.

6.5.3 Malintent Trauma in Middle Horizon 3-4 Samples from Other Regions

There is very little information available from the latest part of the Middle Horizon and the transition to the LIP (see Table 6.10).

Tung (2014b) reported that cranial trauma was present in 50% of the males, 63.3% of the females (including two perimortem cases) and 66.6% of the subadults (one young adolescent with an antemortem fracture close to the bregma and an infant with a perimortem blow to the left parietal) in Huari, the Wari capital (Cheqo Wasi sector). This represents a rise in the prevalence of cranial trauma, with respect to other sites of the Ayacucho area (e.g. Conchopata, Trigo Pampa and Ñawinpukio) from the previous period (see Tung 2014b). Although females presented a higher prevalence of trauma than males, males showed on average more lesions per individual. The location of the trauma was also different. Although both males and females presented the majority of fractures in the superior part of the skull, males also presented many lesions on the anterior part, while females did in the posterior part.

In the Chachapoyas region (north-eastern highlands), Jakobsen and colleagues (1986-1987) calculated a prevalence of 17.9% of healed cranial in males and 0% in females, which does not differ greatly from the situation reported in the first part of the MH. However, other investigators have reported the presence of lethal trauma in some males of the region (dating from the earlier MH 1 to the later LH).

Lessa and Mendonça (2007) stated that the rates of violent trauma dropped in comparison to the preceding Tiwanaku period in northern Chile. Conversely, Torres-Rouff and Costa (2006), based in their studies on the same Solcor 3 material affirmed the opposite. Combining the data available from this period[108] and comparing it with the combined data of the Middle Period, it seems that Torres-Rouff and Costa were correct. Not only had the prevalence of cranial trauma increased from the Middle Period, but so had the number of cases showing multiple lesions (Torres-Rouff and Costa 2006). During this transitional time, the pattern of violence was similar to that of the previous period (mostly antemortem fractures affecting the frontal and nasal bones) (Lessa and Mendonça 2007, Torres-Rouff and Costa 2006; Torres-Rouff and King 2014).

[108] Although there are many publications on cranial trauma from the Coyo 3 site (e.g. Costa and Llagostera 1994; Costa et al. 1998; Lessa and Mendonça 2007; and Torres-Rouff and Costa 2006), for statistical calculations, the results of Lessa and Mendonça were averaged with the most recent publication of Costa: Torres-Rouff and Costa 2006.

Apparently, the prevalence of cranial trauma in males was higher in the central coast than in Huari and northern Chile (Figure 6.5). Nonetheless, cranial trauma in subadults was significantly higher at Huari than at Ancón (odds ratio = 48.33 – 95% CI 1.50-1554.38). Cranial trauma in females was also more prevalent at Huari, although no statistically significant differences were found when this sample was compared to the central coast (odds ratio = 5.25 – 95% CI 0.40-68.95) probably because of the small size of both samples. In the central coast, the Wari heartland, and northern Chile, the latest part of the MH experienced a rise in the prevalence of cranial fractures in adults.

6.5.4 Comparison with the MH 1-2

There was a rise in the prevalence of cranial trauma in adults compared to the previous period, MH 1-2. Despite the small size of the MH 3-4 adult sample (n = 9), the difference was statistically significant in males and adults combined (odds ratio = 11.75 – 95% CI 1.22-113.01 and odds ratio = 4.70 – 95% CI 1.17-18.81 respectively). Perimortem trauma was found in a few individuals from both periods, indicating that during the whole MH period lethal encounters (probably derived from warfare) were present.

Apparently, the target of the blows also changed. Although in both periods males were involved in face-to-face encounters, males presented more fractures to the nasals during the MH 3-4, while Late Lima (MH 1-2) males presented more fractures on the frontal bone. However, preservation could be affecting these results, as individuals from Huaca 20 (the largest of the samples) usually presented great taphonomic damage in the facial area. Other changes were observed on the lesions of females. While Late Lima (MH 1-2) females presented more lesions on the frontal bone (all of them, antemortem), the only female with cranial trauma in Ancón showed a perimortem fracture to the left side of the cranium. However, the small number of individuals from Ancón hinders the interpretations.

Table 6.10: Prevalence of Cranial Fractures Found in Different Andean Regions during the MH 3-4

			Prevalence of Cranial Trauma			
Site and Region	**Culture/ Phase**	**Reference**	**Males**	**Females**	**Adults combined**	**Subadults**
Ancón (central coast)		This study	80% (4/5)	25% (1/4)	55.6% (5/9)	0% (0/14)
Runashayana and Huepón (north-eastern highlands)		Jakobsen et al. 1986-1987	≥17.9% (AM: 5/28, PM: ?)	0% (0/12)	≥12.8% (AM: 6/47, PM: ?) May include one child	0%? (0?/6)
Huari-Cheqo Wasi (south highlands)	Late/Terminal Wari	Tung 2014b	50% (5/10) (15 yrs+)	63.3% (7/11) (15 yrs+)	50% (12/24) (15 yrs+)	66.7% (2/3)
Coyo 3 (northern Chile)	Post-Tiwanaku	Costa and Llagostera 1994 Costa et al. 1998	20% (5/25)	22.7% (5/22)	21.3-24.4% (10/47 or 11/45)	-
Coyo 3 (northern Chile)	Post-Tiwanaku	Torres-Rouff and Costa 2006	37.5% (9/24)	35% (7/20)	36.4% (16/44)	0% (0/1)
Coyo 3 (northern Chile)	Post-Tiwanaku	Lessa and Mendonça 2007*	25% (6/24)	4.5% (1/22)	15.2% (7/46)	-
Quitor 6 Tardío, Yaye 3 and Yaye 4 (northern Chile)	Middle Period-Beginnings of LIP	Torres-Rouff and King 2014	?	?	18.3% (17/93) (may include children and teenagers)	0% (0/?)

* Prevalence calculated based on data presented in that study. Only observable cases were included.

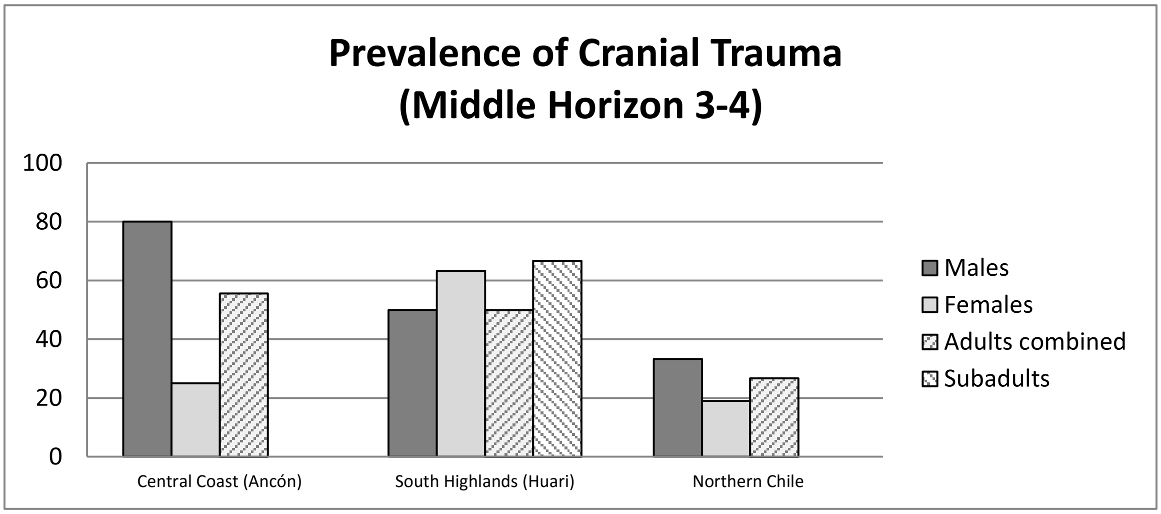

Figure 6.5: Prevalence of Cranial Fractures Found in Different Andean Regions during the MH 3-4

6.5.5 Conclusion: Violence during the MH 3-4

More than 50% of the adults from Ancón experienced violence during their lives, with the males being more affected than females. Males faced both non-lethal face-to-face encounters and deadly events, possibly related to warfare (similar than during the MH 1-2), which could have occasionally affected females.

It seems that the prevalence of cranial trauma in males was higher on the central coast than in the Wari heartland and northern Chile. In all three regions, a rise in the prevalence of cranial trauma in adults with respect to the MH 1-2 was detected. It is possible that a change in the most common location of the traumatic lesions occurred on the central coast. While during the MH 1-2 the most affected area in both males and females was the frontal bone, during the MH 3-4 males presented more lesions on the nasals and the only injured female had a fracture to the left side of the cranium. It is possible then, that the kinds of violence that produced these lesions during the MH 1-2 and the MH 3-4 were also different. However, the small number of individuals in Ancón makes these statements inconclusive.

6.6 Late Intermediate Period

6.6.1 Violence in Armatambo-22 de Octubre

The prevalence of malintent trauma in the Armatambo cemetery "22 de Octubre" was high to very high in adults (53.8% in males and 37.5% in females) and low in subadults (18.2%), affecting approximately half of the individuals aged 12 years and older. All these fractures were located on the skull. However, using the "hat brim line" criterion, the prevalence dropped to 21.4% in males, 18.8% in females and 15.4% in subadults.

There was no difference in the location of malintent fractures by sex, as the majority of fractures were located in the facial area, although there were lesions (in both males and females) on the back of the skull. Lethal trauma was found in 21.4% of the males and 25% of the females (26.7% and 22.2% respectively, including adolescents), especially affecting low status individuals. Most of these lesions were located in the thoracic area, although there were two cases of perimortem trauma to the cranium. One was a male adolescent with three blunt-force perimortem traumatic lesions on the posterior and superior part of the parietals, the right scapular body, and possibly in several ribs; and the other a middle adult female with a blunt-force traumatic lesion on the superior part of the frontal bone, close to the midline. Only one example of perimortem trauma could be most likely accidental (a female with an antemortem fracture in the vertebral body of T11 that occurred close to the death of the individual). Leaving this fracture aside, perimortem trauma possibly associated with violence was identified on 18.8% of females (16.7% including adolescents) and 20% of individuals 12 years and older.

Repetitive traumatic lesions were also common, especially in the thoracic region, affecting 30% of the adults (28.6% of the males and 31.3% of the females). Although in most of these cases the MNEv was 2, there were to cases with a MNEv of 4. The first case, a female of 30-45 years (CF 35), presented fractures in the sternal end of several ribs (right second to sixth and left fourth to seventh) in at least three stages of healing: 1) little woven bone formation (12-20 before death), 2) moderate woven bone formation and bridging (3-4 weeks before the death), and 3) old fractures already reconstructed (more than one year before the death). She also presented a compression fracture in the T11 vertebral body with a very slight remodeling of the broken ends, indicating that the fracture occurred around a week before the woman died (cf. Delabarde 2008; Maat 2008). Most of these lesions were transverse fractures, which are more likely produced by direct blows to the chest (cf. Galloway and Wedel 2014c). She also showed healed fractures on the proximal end of one hand distal phalanx, the distal end of the left fifth metatarsal, and the distal end of the fifth proximal phalanx of the right foot. This repetitive pattern of trauma in the rib cage has been associated with domestic abuse (e.g. Barreto 2012; Salter-Pedersen 2012; and Tung 2012a, 2014a – see Tables 2.8 and 6.1).

The other case was an old male (CF 103) with several broken sternal rib ends in at least four stages of healing: 1) slight remodeling of the broken ends (produced around seven days after the fracture was produced), 2) little woven bone formation (12-20 before death), 3) moderate woven bone formation and bridging (3-4 weeks before the death), and 4) old fractures already reconstructed (more than one year before the death) (cf. Delabarde 2008; Maat 2008). At least some of these lesions could have been produced by a direct hit to the chest, judging from the transverse direction of the fracture. This male also presented perimortem fractures in the necks of de sixth and seventh right ribs[109] and healed fractures in the frontal bone, medial malleolus of the left tibia, navicular of the right foot, distal end of the fifth proximal phalange of the left foot, and right transverse process of L3.

The prevalence, location and severity of the lesions, and MNEv show that individuals (including adolescents) were exposed to different episodes of violence (in many cases with lethal consequences). The prevalence of lethal fractures was higher among low status individuals. The individuals were generally facing their attackers, although some were probably hit while trying to escape from the attack. Males and females both seem to have been involved in warfare, including battle and raiding. It is also possible that at least some females suffered from domestic abuse. The possibility of a massacre is not likely as

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[109] As it is sometimes difficult to differentiate perimortem trauma from antemortem fractures in the initial stage of healing, the MNEv was established as 4 instead of 5.

there were no collective burials containing individuals with perimortem trauma or individuals younger than 12 years affected.

6.6.2 Other LIP Sites of the Central Coast

Few data are available from other LIP collections of the central coast (Table 6.11). The information collected by Chan (2011) in another cemetery of Armatambo ("Héroes del Pacífico")[110] showed that 26.9% of the adults (36.4% of the males, 20% of the females) presented lesions to the skull. Some individuals also showed sharp force trauma. More individuals from the LIP have been recovered from other sectors of Armatambo. However, there are only data available for three females and five subadults, none of them presenting cranial trauma. Nevertheless, one of the females presented a healed parry fracture (Vega 2003).

At Huaca 33 (Pando Complex) more than one hundred individuals (including children) were found, many of them apparently thrown into their graves and buried wearing few (e.g. loincloths) or no clothes (Barreto 2014). The partial analysis published by Barreto reported that 58% (15 out of 36) of the individuals (mostly young adults) presented perimortem lesions, especially blunt force trauma to the skull (although fractures on ribs and limbs, cuts in the neck and puncture wounds in the thorax were also present). Although the analysis is incomplete, the presence of children suggests that these individuals were victims of a massacre. Unfortunately, the chronological affiliation of the context is uncertain, although it is most probably related to the LIP (Late Ychsma phase).

Recently, a team lead by Walter Tosso recovered a number of Chancay individuals intruding into Archaic architecture from Las Shicras (Chancay Valley, northern part of the central coast). The bioarchaeological analysis indicated that 75% of the adults (mostly females) and 50% of the subadults (including children) presented some kind of cranial trauma (most of them, perimortem) (Vega 2014). It seems that these individuals were also the victims of a massacre.

[110] According to Luisa Díaz (personal communication 2015), this cemetery was dated from the earliest part of the LIP, while 22 de Octubre from the latest part of the same period.

Table 6.11: Prevalence of Cranial Fractures Found on the Central Coast during the LIP

Site and Region	Culture/ Phase	Reference	Prevalence of Cranial Trauma: Males	Females	Adults combined	Subadults
Armatambo- 22 de Octubre (central coast)	Middle-Late Ychsma	This study	50% (7/14)	37.5% (6/16)	43.3% (13/30)	18.2% (2/11)
Armatambo-H. del Pacífico (central coast)	Early-Middle Ychsma?	Chan 2011	36.4% (4/11)	20% (3/15)	26.9% (7/26)	?
Armatambo (central coast)	Ychsma	Vega 2003	-	0/3	0/3	0/5
Huaca 33- Maranga (central coast)	Late Ychsma?	Barreto 2014	?	?	57.7% (15/26) (including subadults)	?
Las Shicras (central coast)	Chancay	Vega 2014	50% (1/2)	83.3% (5/6)	75% (6/8)	50% (2/4)

* Prevalence calculated based on data presented in that study. Only observable cases were included.

6.6.3 Malintent Trauma in LIP Samples from of Other Regions

Although cranial trauma in the north and north-central coast during this period was rare, the region also witnessed episodes of extreme violence, as was seen in the massacre of Punta Lobos. Verano and Toyne (2011) identified a MNI of 178 individuals (juveniles and adult males, mostly of them young adults) who were killed in a single event. Seventy-seven of them (71.3%) presented at least one cut in the neck or upper part of the thorax. Many of these individuals were superficially buried lying face down, with their wrists and/or legs tied and with a bandage across their eyes. Like the victims from Huaca 33, some of these individuals were only wearing a loincloth. Antemortem cranial trauma (affecting mostly the nasal bones) was found in 18.2% of the individuals (Verano and Toyne 2011). The demographic profile of the victims, plus the absence of fractures usually found in warriors suggest that these individuals were non-combatants (Phillips 2009; Verano and Toyne 2011). However, the tradition of killing of captive warriors continued on the north coast, as was evident in the mass grave from Pacatnamú studied by Verano (1986).

In contrast, the evidence for the southern Peruvian coast (Osmore Valley) showed a very low prevalence of trauma (Table 6.12). Burgess (1999) only reported two cases of antemortem facial trauma and a female with antemortem trauma to the vault. However, it is not clear if they represented two or three individual cases. This calculation could also underestimate the true prevalence of trauma, as Burgess excluded perimortem trauma from her analysis. Williams (1990) presented three males with antemortem trauma to the face and frontal and two females with antemortem fractures near the squamosal suture.

In the Chachapoyas region, the prevalence of trauma in adults ranged from 20 to 50%. Males were more affected than females, although the difference varies. According to Nystrom and Toyne (2014) the difference between the sexes was not significant in the sites they studied, while Urizar (2009) stated that in the two sites that were included in her sample, males were significantly more affected than females. Both studies also showed different patterns of violence. Although in both studies antemortem trauma was more common than perimortem trauma, Nystrom and Toyne (2014) stated that the facial bones (especially the nasals) were more affected, while Urizar (2009) found more lesions on the frontal and parietal bones. Nystrom and Toyne (2014) also affirmed that violence was similar between sexes and between adults and subadults.

Titelbaum and colleagues (2013) reported that a third of the adults from the site of Marcajirca (Ancash region, north-central highlands) presented antemortem or perimortem cranial trauma, mostly affecting the frontal and nasals.

Table 6.12: Prevalence of Cranial Fractures Found on the North, North-Central, and South Coast during the LIP

			Prevalence of Cranial Trauma			
Site and Region	**Culture/ Phase**	**Reference**	**Males**	**Females**	**Adults combined**	**Subadults**
Santa Rita B (north coast)	Pre-Chimú	Gaither et al. 2008*	O% (0/1)	-	0% (0/1)	0% (0/3)
Huaca de la Luna (north coast)	Chimú	Escudero 2004* Millones 2004*	0% (0/2)	0% (0/2)	0% (0/4)	0% (0/7)
Lambayeque Valley (north coast)	Chimú	Klaus 2014*	0% (0/?)	?% (1/?)	1.4% (1/69) (including subadults)	0% (0/?)
Pacatnamú (north coast)	Chimú	Verano 1986*	8.3% (1/12) (15 yrs+)	-	8.3% (1/12) (15 yrs+)	-
Huaca Chotuna (north coast)	Chimú	Verano 2011*	-	-	-	0% (0/1)
Punta Lobos (north-central coast)	Chimú	Verano and Toyne 2011	18.2% (22/121) (including subadults)	-	18.2% (22/121) (including subadults)	?
Cerro Lampay (north-central coast)		Vega-Centeno et al. 2006	0% (0/1)	0% (0/1)	0% (0/2)	0% (0/1)
Estuquiña (south coast)	Lupaca	Williams 1990*	5% (3/60)	4.7% (2/43)	4.9% (5/103)	-
Osmore Valley (south coast)	Chiribaya	Burgess 1999*	?	?	0.5-0.7% (2-3/425)	0% (0/≥92)

* Prevalence calculated based on data presented in that study. Only observable cases were included.

The south highlands (especially the Ayacucho and Andahuaylas regions) presented the highest prevalences of cranial trauma of the Andean region during this period, affecting between 55 and 85% of the adults (higher than in the Wari era). In the former Wari capital, Tung (2008b, 2014a) observed antemortem and perimortem trauma, located mostly in the facial/anterior cranial area both in males and females (although the location in the former was slightly more variable). In Andahuaylas, Kurin (2012, 2014) found that violence increased from the previous Wari period, and that it was present in a variety of forms throughout the region. She concluded that males faced deadly encounters, while females could have been involved in diverse violent scenarios, including violent encounters, affinal/domestic abuse, interpersonal conflict, and raids. Individuals of the Chanka ethnicity faced more deadly encounters and were possibly victims of ethnocide, as the majority of perimortem trauma was found among the modified skulls.

In the Cuzco region, Andrushko and Torres (2011) reported a prevalence of 23.6% of cranial trauma in adults (39% in males, 12.9% in females). Although the prevalence of cranial trauma was higher than in the previous time period, the rate of major trauma (perimortem and large antemortem fractures) stayed about the same. Only in the peripheral sites did the rate of major cranial trauma increase. The authors attributed this to an increase in non-lethal violence (e.g. small-scale raids, skirmishes, and ritual conflicts) (Table 6.13).

In the Titicaca Basin, the overall prevalence of cranial trauma in adults was low (16.0%). De la Vega and colleagues (2005) reported 14.6% of cranial trauma in adults from the site of Molino-Chilacachi (affecting the frontal and parietal bones). Although most of these fractures were produced prior the death of the individual, there were also two perimortem fractures. Torres-Rouff (2013) reported that 36 individuals (out of 237) from the sites Kupa Pukio Chullpa and Tama Tam Chullpa presented cranial trauma. Juengst and colleagues (2015) presented a small sample from Ch'si, in which two males presented antemortem trauma to the frontal and two females demonstrated antemortem fractures in facial bones.

Finally, several sites from northern Chile that have been studied presented a prevalence of cranial trauma in adults that ranged from 7 to 27.3%. Fouant (1984) reported one male with perimortem trauma in the left side of the vault and a female adolescent with a healed traumatic lesion in the left parietal. In Catarpe 2, Lessa (2006) calculated a prevalence of 7.6% of cranial trauma in males and 7.1% in females, affecting the frontal and the left parietals. There were no facial traumatic lesions, although an arrow embedded in the face of one male was found. In other sites of San Pedro de Atacama (Yaye, Quitor 6, and

Catarpe 4-5) Torres-Rouff and Costa (2006) found that 26% of the males, 30.4% of the females, and 4.8% of the subadults presented cranial trauma (mostly antemortem fractures affecting the nasal bones in both sexes). Torres-Rouff and Costa (2006) noticed that the prevalence of cranial trauma decreased compared to the MH (albeit the cases of perimortem trauma increased), reaching the lower rate in the final part of the LIP (Catarpe 4-5) (Table 6.14). Similarly, Pacheco and Retamal (2014) reported 8.8% of prevalence of cranial trauma in adults from Pica 8, all of them antemortem and mostly located in the frontal and facial area. Based in this low prevalence of cranial trauma and the non-lethal nature of the lesions, Pacheco and Retamal (2014) concluded that the individuals of this site did not experience war.

With the exception of the south highlands (especially Ayacucho and Andahuaylas) and the Chancay burials from Las Shicras, the Ychsma from the central coast presented the highest prevalences of cranial trauma in the central Andean region during this period (Figure 6.6). The difference between females and combined adults from the Ychsma territory and Las Shicras were statistically significant (odds ratio = 13.89 – 95% CI 1.42-135.55 and odds ratio = 5.85 – 95% CI 1.08-31.66 respectively). A statistically significant difference was also found between females from the Ychsma area and those from the south highlands (odds ratio = 2.45 – 95% CI 1.08-5.55), meaning that the Ychsma females experienced less violence that females from the south highlands

The prevalence of cranial trauma was consistently higher in every category (males, females, combined adults, and subadults) between individuals from the Ychsma from the central coast and the north coast (Chimú), south coast (Moquegua), north-eastern highlands (Chachapoya), the Titicaca Basin, and northern Chile regions. Nevertheless, statistical significance was only found in the comparison with Chimú males and combined adults (odds ratio = 3.83 – 95% CI 1.54-9.49 and odds ratio = 2.54 – 95% CI 1.26-5.12 respectively), Chachapoya males (odds ratio = 2.57 – 95% CI 1.10-6.05), combined adults from the Titicaca Basin (odds ratio = 2.68 – 95% CI 1.44-5.0), and males and combined adults from northern Chile (odds ratio = 3.99 – 95% CI 1.69-9.42 and odds ratio = 2.57 – 95% CI 1.42-4.67 respectively). The difference in the prevalence of cranial trauma in subadults between the central coast and northern Chile was almost significant (odds ratio = 11.29 – 95% CI 0.96-133.01). The difference with the Moquegua region was statistically significant in every category (odds ratio = 14.93 – 95% CI 3.67-60.79 in males, odds ratio = 7.38 – 95% CI 1.47-36.95 in females, odds ratio = 33.33 – 95% CI 13.80-80.54 in combined adults, and odds ratio = 31.90 – 95% CI 1.46-698.52 in subadults).

A high prevalence of cranial trauma in adults (over 30%) was found on the central coast, the south highlands (Ayacucho and Andahuaylas), followed closely by the Chachapoya. An elevation of the prevalence of cranial trauma in adults compared with the MH 1-2 was experienced in the central coast, the south highlands (including the Cuzco area), northern Chile, the Titicaca Basin, and the Peruvian north coast. In the three former areas, the prevalence of cranial trauma in adults decreased slightly with respect to the MH 3-4. The prevalence of cranial trauma in subadults was clearly higher during the LIP than in the MH 3-4 on the central coast and northern Chile region. Tung and colleagues (2016) also reported that the prevalence of cranial trauma in subadults increased at the Huari site in the LIP, with respect to the Wari period. A noticeable increase in the number of cases of fatal wounds during these periods in different regions (e.g. the central coast, south highlands, and northern Chile) was evident, including different massacre episodes in the north and central coast. The bioarchaeological evidence of violence is supported by the introduction of defensive architecture in different central Andean regions (including the central coast) (e.g. Arkush 2011; Arkush and Tung 2013; Brown Vega 2008, 2009, 2010; Brown Vega et al. 2011; Covey 2008; Reindel 2009; Silva 1996; Wernke 2006; and Wilson 1995).

Table 6.13: Prevalence of Cranial Fractures Found in the North and South Highlands during the LIP

			Prevalence of Cranial Trauma			
Site and Region	**Culture/ Phase**	**Reference**	**Males**	**Females**	**Adults combined**	**Subadults**
Huayabama, Revash, & Kuelap (NE highlands)	Chachapoya	Nystrom and Toyne 2014*	23.4% (47/201)	17.3% (22/127)	20.5% (71/347)	3.4% (4/118)
Luya region (NE highlands)	Chachapoya	Darcy et al. 2010 (cited by Arkush and Tung 2013)	?	?	48.1% (13/27) (15 yrs+)	-
Muyucsha and Laguna de los Cóndores (NE highlands)	Chachapoya	Urizar 2009	?	?	49.6% (67/135) (15 yrs+)	-
Marcajirca (north-central highlands)		Titelbaum et al. 2013	?	?	33.3% (8/24)	-
Huari-Monqachayoq (south highlands)	Post-Wari	Tung 2008b, 2014a	83.3% (15/18) (15 yrs+)	90.9% (10/11) (15 yrs+)	83.9% (26/31) (15 yrs+)	30% (3/10)
Huari-Vegachayoq Moqo and machays (south highlands)	Post-Wari	Tung et al. 2016*	?	?	?	37.5% (3/8)
Andahuaylas (south highlands)	Chanka	Kurin 2012, 2014	59.2% (58/98) (15 yrs+)	64.1% (59/92) (15 yrs+)	55.5% (121/218) (15 yrs+)	14.3% (3/21)
Pucullu (south highlands)	Quichua	Kurin 2012, 2014	80% (12/15) (15 yrs+)	50% (5/10) (15 yrs+)	68% (17/25) (15 yrs+)	0%? (0?/9)
Cuzco region (south highlands)		Andrushko and Torres 2011	39% (30/77) (15 yrs+)	12.9% (8/62) (15 yrs+)	23.6% (47/199) (15 yrs+)	-

* Prevalence calculated based on data presented in that study. Only observable cases were included.

Table 6.14: Prevalence of Cranial Fractures Found in the Titicaca Basin (Bolivia) and Northern Chile during the LIP

			Prevalence of Cranial Trauma			
Site and Region	**Culture/ Phase**	**Reference**	**Males**	**Females**	**Adults combined**	**Subadults**
Molino-Chilacachi (Titicaca Basin, Peru)	Altiplano Period	De la Vega et al. 2005*	?	?	14.6% (7/48) (15 yrs+)	0% (0/33)
Kupa Pukio Chullpa and Tama Tam Chullpa (Titicaca Basin, Bolivia)		Torres-Rouff 2013*	?	?	15.2% (36/237) (may include subadults)	-
Ch'isi (Titicaca Basin, Bolivia)		Juengst et al. 2015*	50% (2/4)	50% (2/4)	50% (4/8)	-
Azapa Valley (northern Chile)	Regional Period	Fouant 1984*	20% (1/5) (15 yrs+)	16.7% (1/6) (15 yrs+)	18.2% (2/11) (15 yrs+)	0% (0/30?)
Catarpe 2 (northern Chile)	Post-Tiwanaku	Lessa 2006	7.6% (8/105)	7.1% (4/56)	7.5% (12/161)	-
Quitor 6 (northern Chile)	Post-Tiwanaku	Costa et al. 1998	?	?	20% (6/30)	-
Yaye, Quitor 6, Catarpe 4-5 (northern Chile)	Post-Tiwanaku	Torres-Rouff and Costa 2006* Torres-Rouff et al. 2005	26% (27/104)	30.4% (24/79)	27.3% (51/187)	4.8% (1/21)
Pica 8 (northern Chile)		Pacheco and Retamal 2014	13.8% (4/29)	5.3% (2/38)	8.8% (6/68)	0% (0/29)

* Prevalence calculated based on data presented in that study. Only observable cases were included.

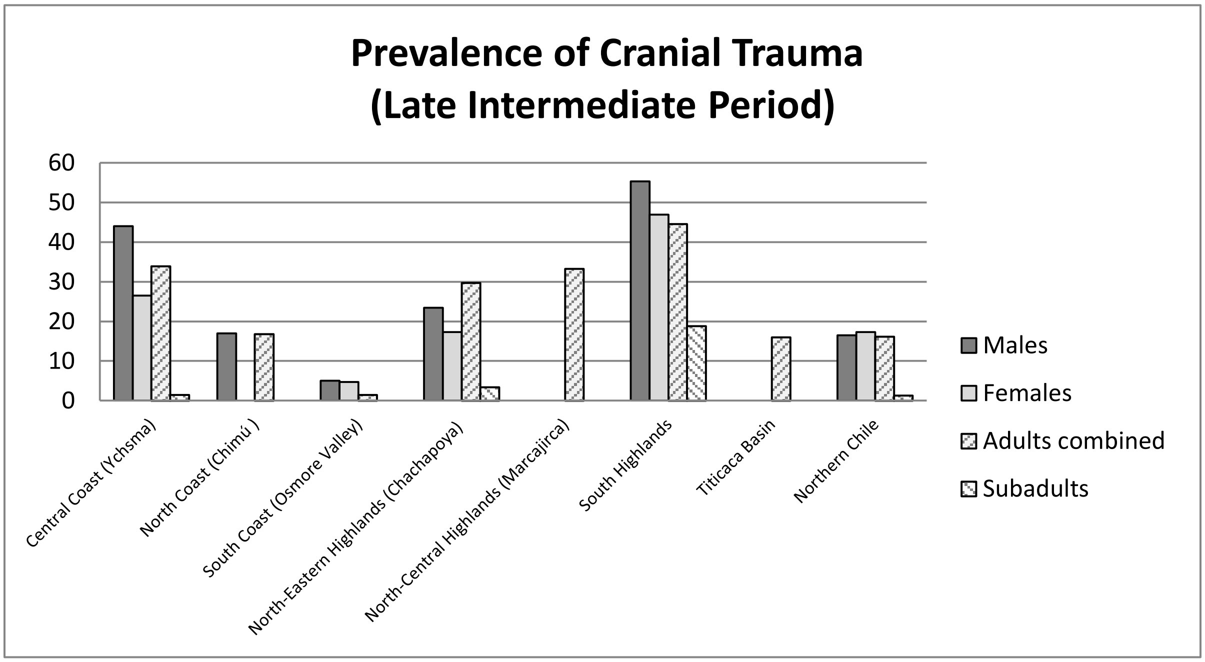

Figure 6.6: Prevalence of Cranial Fractures Found in Different Andean Regions during the LIP

6.6.4 Comparison with the MH 3-4

The prevalence of cranial trauma in males and combined adults demonstrated a slight decrease during the LIP in comparison with the MH 3-4 (from 80% to 44% and from 55.6% to 33.9% respectively). Conversely, the prevalence of cranial trauma in subadults increased during the LIP (from 0% to 12.5%) The difference of cranial trauma between males and females decreased in the LIP. More cases of lethal and multiple events of violence were found during the LIP. However, no statistical significance was found, possibly due to the small size of the MH 3-4 adult sample (n = 9).

In both periods, the individuals were victims of warfare episodes. It is possible that during the LIP the levels of violence were higher (or at least more frequent and lethal) than during the MH 3-4. It seems that warfare (largely extended throughout the region after the fall of the Wari and Tiwanaku Empires) became more common during the LIP, affecting the whole population (including women and adolescents) than during the MH 3-4. However, this hypothesis needs the support of a larger MH 3-4 sample.

6.6.5 Conclusion: Violence during the LIP

Previous publications (e.g. Arkush and Tung 2013; Brown Vega 2008, 2009, 2010; Brown Vega et al. 2011; Parsons and Hastings 1988) proposed that the LIP was a period of extended violence and warfare, and our data presented here confirmed that the central coast did not escape from this phenomenon. Warfare (in the form of battle, raiding and massacres) was experienced by the Ychsma during the LIP. Signs of violence targeting the head and thorax was found in the skeleton of approximately one half of the population older than 12 years from the Armatambo- 22 de Octubre. Most of them (both males and females) were facing their attackers. Violence seemed to have affected especially the low status segment of the society. There is also a possible case of domestic abuse.

The prevalence of cranial trauma on the central coast was generally higher (especially in males) than in other regions (with exception of the south highlands and the Chancay individuals from Las Shicras). Conversely, the prevalence of cranial trauma in females from the central coast was significantly lower than in the south highlands and in Las Shicras (Chancay Valley). Although a slight decreased in the prevalence of adult malintent trauma was demonstrated from the MH 3-4, violence became more lethal and repetitive than in the previous time period, a phenomenon also seen in other Andean regions such as the south highlands and northern Chile.

6.7 Late Horizon

6.7.1 Violence in Pueblo Viejo and Puruchuco-57AS03

The prevalence of malintent trauma in Pueblo Viejo-Pucará was similar between males and females (34.8% and 39.1% respectively). The location of the fractures suggests that males and females faced similar types of violence. Males showed similar proportions of anterior and posterior/basal fractures. Although females presented more lesions in the anterior aspect of the skull (mostly in the frontal bone), they also showed some cases of fractures on the back of the skull. One male and one female also showed parry fractures. Fatal injuries and repetitive trauma were rare, but present in males and females. There was also a 3-4 year-old child with antemortem trauma in the superior part of the right parietal. Malintent and rib fractures were more common in males from the military settlement than in males from the other sectors of the site.

The case of a young male (SIV-1 CF 3-II) from the military sector is interesting, as he presented a sole perimortem sharp-blunt force trauma to the base of the occipital, an area that is difficult to reach unless the neck is hyperflexed (José Pablo Baraybar, personal communication 2016). Thus, it is possible that this individual was a soldier killed after his surrender or capture (when he was in a submissive position) or that the lesion could have been the finishing blow (after receiving other hits that did not damage the skeleton).

No difference was found in the prevalence of these traumatic lesions in females from different sectors. Occasional battles and raiding seemed to have been present in Pueblo-Viejo Pucará, activities in which males from the military sector were more involved than their peers from the other parts of the site. Ritual violence seems unlikely, as the majority of individuals presented only one skull fracture. The exceptions were two individuals (a male and a female) with two fractures in the back of the skull which could have been produced in a single event.

The information about trauma in Puruchuco-57AS03 adults was limited to perimortem lesions. Malintent perimortem trauma was present in 7.1% of the males, 8% of the females, and 12.5% of the subadults. Malintent trauma (both perimortem and antemortem) was present in 16.7% of the subadults. Perimortem trauma in males was not concentrated in a single area. On the contrary, the two males with perimortem trauma showed multiple cranial lesions to the face and vault, as well as fractures in various thoracic bones. Perimortem cranial trauma in females was located only in the facial area (accompanied by fractures in the thorax). Compared to Pueblo Viejo, individuals from this Puruchuco cemetery presented more cases of malintent perimortem trauma (especially in subadults), with adults showing many cases of highly lethal trauma. Perimortem trauma to the skull and ribs was more common in low status individuals and soldiers. Given the characteristics of the lesions, it seems that some of the individuals from Puruchuco were involved in battles. Although it is very likely (judging by the weapons found in their burials) that males were warriors, the role of females is more difficult to assess as the ethnohistoric information presented in Chapter 3 placed women on the battlefield both in active and passive roles. However, it is also possible that some of the individuals showing perimortem trauma died at the end of the Late Horizon, fighting the European newcomers, and were buried according to the local costumes. The presence of gunshot wounds in Puruchuco (Lund 2009; Murphy et al. 2010, 2011), and another suspicious case gunshot wound in Pueblo Viejo (José Pablo Baraybar, personal communication 2015) gives support to this possibility. However, the strategic location of both sites in areas that connect directly to the central highlands (one in the Rimac Valley, the other in the Lurín Valley) could explain the presence of soldiers, who could have sustained injuries while serving the Inca state.

6.7.2 Violence in the Different *Curacazgos*/*Ayllus* of the Rímac and Lurín Valleys

Few individuals were found in the Caringa site of Malanche 22. Only one individual (an adult female) presented a healing fracture in the left side of the frontal (Mujica et al. 1992). When data from Malanche 22 and Pueblo Viejo-Pucará were combined, the prevalence of cranial trauma for the *ayllu* Caringa was 29.2% in males, 33.3% in females, and 2.6% in subadults.

There are more samples available for the *curacazgo* Lati. Besides the individuals from the Puruchuco-57AS03 cemetery, Murphy (2004) studied around 160 individuals from the Puruchuco-Huaquerones cemetery, reporting many cases of lethal and non-lethal fractures located usually on the frontal and parietals and affecting more males than females (approximately 26.4% vs.12.1% respectively). She also presented some cases of ulnar fracture. Although the author did not state it directly, it is possible that at least some of them could be defensive fractures. Gaither (2012) presented nine possible cases of "Likely caregiver-induced violence" (5.3%, 9 out of 169) in subadults from Puruchuco-Huaquerones.

Salter-Pedersen (2011a) reported six males and two females (including one possible case of domestic abuse) from the Rinconada cemetery with antemortem trauma to the face and vault. Three males and one female also showed parry fractures. Perimortem fractures were present in six adult males and two male adolescents, most commonly located in the occipital and the left parietal. Three of these individuals were buried together, and were possibly killed in the same event. An extra Rinconada individual (a male soldier) reported by Frame and collaborators (2004) did not show any malintent trauma. None of the three females recovered in San Juan de Pariachi presented malintent trauma, although a male presented a healed parry fracture (Vega 2008). When all these data are combined, the result is a prevalence of cranial trauma of 26.2% in males, 10.4% in females, and 3.3% in subadults from the *curacazgo* Lati.

In the *curacazgo* Malanca, only the site of Makat-Tampu presented cases of antemortem and perimortem trauma, affecting nasal, frontal, and parietal bones (Altamirano et al. 2006). No malintent trauma was reported in the sites of Huantinamarca or in some *huacas* of Parque de Las Leyendas (Boza 2010; Vega 2011c). The combined data of the three sites gave a prevalence of 4.2% of cranial trauma in adults.

In Pachacamac (the capital of the *ayllu* Pachacamac) around 12.6% of the adults presented antemortem fractures to the skull, affecting especially the frontal and parietal bones. Six out of 19 individuals also presented perimortem cranial trauma in the back of the skull (Eeckhout and Owens 2008). However, as these individuals were possibly sacrificed, these fracture were not used to calculate prevalence.

Finally, in Pampa de Las Flores, an important Ychsma site of the *ayllu* Manchay, antemortem fractures to the frontal and parietal bones were reported in four males and four females. There was also an isolated case of parry fracture in an adult of unknown sex (Eeckhout 1999a) (Table 6.15).

Table 6.15: Prevalence of Cranial Fractures Found on the Central Coast during the Late Horizon

Site and Region	*Curacazgo/ Ayllu*	Reference	Prevalence of Cranial Trauma			
			Males	Females	Adults combined	Subadults
Pueblo Viejo-Pucará	Ychsma-Caringa	This study	30.4% (7/23)	33.3% (8/24)	31.9% (15/47)	3.2% (1/31)
Malanche 22	Ychsma-Caringa	Baraybar 1999; Mujica et al. 1992	0% (0/1)	33.3% (1/3)	25% (1/4)	0% (0/7)
Puruchuco-57AS03	Ychsma-Lati	This study	40% (2/5)	40% (2/5)	40% (4/10)	11.5% (3/26)
Puruchuco-Huaquerones	Ychsma-Lati	Murphy 2004*	19.4-31.9% (14-23/72) (15 yrs+)	8.6-15.2% (5-9/58) (15 yrs+)	14.6-24.6% (19-32/130) (15 yrs+)	0% (0/60)
Rinconada	Ychsma-Lati	Salter-Pedersen 2011a*	25% (12/48) (12 yrs+)	5% (2/40) (12 yrs+)	15.4% (14/91) (12 yrs+)	0% (0/6?)
Rinconada	Ychsma-Lati	Frame et al. 2004	0% (0/1)	-	0% (0/1)	-
San Juan de Pariachi	Ychsma-Lati	Vega 2008*	-	0% (0/3)	0% (0/3)	-
Makat-Tampu	Ychsma-Malanca	Altamirano et al. 2006	(9/?)	(2/?)	4.6% (11/241) (may include subadults)	?
Parque de Las Leyendas	Ychsma-Malanca	Boza 2010	0% (0/5)	0% (0/7)	0% (0/12)	0% (0/3)
Huantinamarca	Ychsma-Malanca	Vega 2011c*	0% (0/3)	0% (0/3)	0% (0/9)	0% (0/7)
Armatambo-Virgen del Morro	Ychsma-Sulco	Vega 2003	-	-	-	0% (0/1)
Pachacamac	Ychsma-Pachacamac	Eeckhout and Owens 2008*	?	?	~12.6% (13?/103)	?
Pampa de Las Flores	Ychsma-Manchay	Eeckhout 1999a	≥8.3% (4/48?)	≥5.1% (4/79?)	≥6.3% (8/127?)	0% (0/62?)

* Prevalence calculated based on data presented in that study. Only observable cases were included.

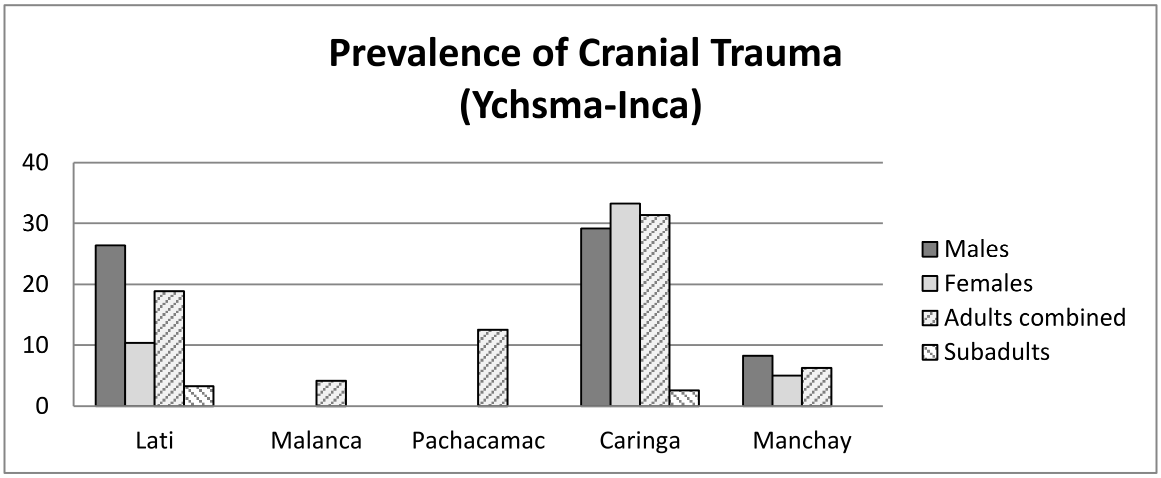

Figure 6.7: Prevalence of Cranial Fractures Found in Different Ychsma *Curacazgos*/*Ayllus* during the LH

The comparison of all these prevalences indicates that the Caringa and the Lati presented more cranial trauma than the other Ychsma *curacazgos*/*ayllus* (Figure 6.7). While the prevalences of cranial traumatic lesions in males and subadults were about the same in this both polities (~25-30% and ~3% respectively), rates of cranial trauma in females were significantly higher in the Caringa group, as was the prevalence of cranial trauma in adults combined (odds ratio = 4.32 – 95% CI 1.57-11.91, and odds ratio = 1.98 – 95% CI 1.01-3.90, respectively).

The prevalence of cranial fractures in adults was significantly lower in the *curacazgo* Malanca than in the Caringa and Lati groups (odds ratio = 10.43 – 95% CI 4.48-24.29, and odds ratio = 5.26 – 95% CI 2.64-10.45, respectively). Cranial trauma in adults from Pachacamac was also significantly lower than in the Caringa group (odds ratio = 3.16 – 95% CI 1.38-7.25). Finally, the prevalence of cranial trauma in Manchay was also significantly lower than in Caringa and Lati. Statistical significance was found in the comparison of males from both groups (odds ratio = 4.53 – 95% CI 1.17-17.47 with the Caringa, and odds ratio = 3.90 – 95% CI 1.30-11.70 with the Lati). Similar significance was found in the comparison with the combined adults (odds ratio = 6.80 – 95% CI 2.69-17.21 with the Caringa, and odds ratio = 3.43 – 95% CI 1.56-7.53 with the Lati). Caringa females also presented a higher prevalence of cranial trauma than the Manchay females (odds ratio = 9.38 – 95% CI 2.59-33.90). This differences indicates that violence was more prevalent (both in males and females) in the two areas with more archaeological evidence of military presence among the Ychsma: the Lati and the Caringa. However, it must be acknowledged that the prevalences presented for the Manchay and the site of Makat-Tampu are problematic, as the first was calculated in basis of incomplete and commingled remains, while the other possibly includes subadults.

6.7.3 Malintent Trauma in Late Horizon Samples from Other Regions

A slight increase in the prevalence of cranial trauma in adults was observed in the north coast during this period. Around 20-25% of the individuals from Túcume analyzed by Toyne (2002, 2008) (excluding trauma associable to sacrifice) presented at least one cranial traumatic lesion. Most of these lesions were located in the nasal bones, although males also presented fractures in the frontal and females in the back of the skull. Verano (2011) also reported an antemortem lesion in the frontal bone of an adult male. However, it was not clear if it had a traumatic or infectious origin. Klaus (2014) did not find any cranial trauma in the Late Horizon individuals from the Lambayeque Valley that he studied.

Cranial trauma prevalence from the Chachapoyas region was more difficult to calculate. Jakobsen and collaborators (1986-1987) only presented rates of antemortem trauma (~20% in adults), while Bracamonte (2002, 2004) observed 31 individuals with cranial trauma (including one subadult) in a total of 153 individuals from Los Pinchudos (20.3% of the total of her sample) (Table 6.16).

Table 6.16: Prevalence of Cranial Fractures Found in the North Coast and the North-Eastern Highlands during the Late Horizon

			Prevalence of Cranial Trauma			
Site and Region	**Culture/ Phase**	**Reference**	**Males**	**Females**	**Adults combined**	**Subadults**
Lambayeque Valley (north coast)	Chimú-Inca	Klaus 2014*	0% (0/?)	0% (0/?)	0% (0/64) (including subadults)	0% (0/?)
Túcume-Templo de la Piedra Sagrada (north coast)	Chimú/Chimú-Inca	Toyne 2008	22.8% (13/57)	-	22.8% (13/57)	5% (2/40)
Túcume-Huaca Larga (north coast)	Chimú-Inca	Toyne 2002*	66.7% (2/3)	17.4% (3/17) (15 yrs+)	25% (5/20) (15 yrs+)	0% (0/2)
Chotuna-Huaca Gloria (north coast)	Chimú-Inca	Verano 2011*	25% (1/4)	-	25% (1/4)	-
Salsipuedes (north highlands)	Chachapoya	Jakobsen et al. 1986-1987	≥36.4% (AM: 4/11, PM: ?)	12.5% (1/8)	≥21.7% (AM: 5/23, PM: ?)	0% (0/4)
Los Pinchudos (north-eastern highlands)	Chachapoya	Bracamonte 2002, 2004 Nystrom and Toyne 2014	?	?	20.3% (31/153) (including subadults)	? (1/?)

* Prevalence calculated based on data presented in that study. Only observable cases were included.

The central highlands presented high to very high prevalence of cranial trauma (including many cases of perimortem trauma in adults of both sexes and subadults, some of them associated with trephination). In the site of Cashamarca (a Tarama site from the Junín region), 60% of the sample analyzed by Baraybar (2009)[111] presented at least one fracture (mostly a combination of antemortem and perimortem trauma in a single individual). Most of the males presented lesions in the anterior aspect of the skull (although there were also some lesions on the back of the skull), while females presented lesions on the anterior, superior, and posterior part of the skull. The only subadult with cranial trauma was an individual in late childhood, who presented a perimortem trauma to

[111] Rates were calculated based on Baraybar's study and data directly collected from the recording forms stored in the Peruvian Forensic Anthropology Team archives.

the back of the cranium. In a sample consisting of 212 crania with trephination from Huarochirí (a Yauyos group), Verano (2003b) observed a prevalence of trauma in 55.7% of the males, 31.6% of the females, and 26.9% of the subadults. However, the overall prevalence of cranial trauma was higher, as 26.2% of the 457 trephinations recorded by the author were directly related to trauma. As Verano (2003b) also stated, it is very possible that trephinations erased the evidence of trauma (the trephinations could have been performed to ease the intracranial pressure caused by the traumatic injury).

In Cuzco, the Inca core, the available data indicate that the prevalence of cranial trauma in adults was around 15%. Andrusko and Torres (2011) calculated a prevalence of cranial trauma of 27.5% in males, and 20.3% in females). Although the prevalence of cranial trauma is similar in their LIP and LH samples, major cranial trauma increased during the Inca time (few cases in the periphery, none in the Cuzco centre). The prevalence of female minor antemortem fractures also increased in this period.

Verano (2003c) reported few cases of cranial trauma for the site of Machu Picchu: one female (with antemortem fractures to the frontal and antero-superior part of the right parietal), a male with a broken nasal and other male with a possible healed trauma to the right maxilla. MacCurdy (1923) presented 35 cases of fractures (some of them perimortem and associated to trephination) from different sites of the Cuzco region. More to the south, in the Colca Valley (Arequipa region), Tung and colleagues reported 50% (9 out of 18) of individuals with cranial fractures (Arkush and Tung 2013).

Finally, Torres-Rouff and Costa (2006)[112] observed trauma in 3.8% of the adult crania (mostly affecting the anterior part of the skull in males and the face and temporal bone in females) in Catarpe 1 and 2 (northern Chile), representing a decrease in violence from the LIP, the previous time period (Table 6.17).

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[112] The authors presented previous work (Torres-Rouff et al. 2005) on the material from Catarpe. However, this dissertation uses the prevalence presented in the most recent version of their work. In addition, another study including Inca individuals was published by Lessa (2009). However, she included individuals from one site (Catarpe 5) that have been identified as Terminal LIP by Torres-Rouff and Costa (2006).

Table 6.17: Prevalence of Cranial Fractures Found in the Central and South Highlands, and Northern Chile during the Late Horizon

			Prevalence of Cranial Trauma			
Site and Region	**Culture/ Phase**	**Reference**	**Males**	**Females**	**Adults combined**	**Subadults**
Cashamarca (central highlands)	Tarama-Inca	Baraybar 2009*	54.5% (6/11)	66.7% (2/3)	60% (9/15)	8.3% (1/12)
Huarochirí Province (central highlands)	Yauyos/Yauyos-Inca	Verano 2003b*	AM: 55.7% (49?/88?)	AM: 31.6% (31?/98?)	AM: 43.0%? (80?/186)	AM: 26.9% (7/26)
Cuzco region (south highlands)	Inca	Andrushko and Torres 2011	27.5% (22/80) (15 yrs+)	20.3% (24/118) (15 yrs+)	22.8% (50/219) (15 yrs+)	-
Machu Picchu (south highlands)	Inca	Verano 2003c*	7.1% (2/28)	2.5% (1/40)	4.2% (3/71)	0% (0/10)
Cuzco region (south highlands)	Pre-Inca?-Inca	MacCurdy 1923*	?	?	12.8% (35/273) (may include children)	?
Colca Valley (south highlands)	Collagua/Collagua-Inca	Tung et al. 2008 (cited by Arkush and Tung 2013)	?	?	50% (9/18) (15 yrs+)	-
Catarpe (northern Chile)	Inca	Torres-Rouff et al. 2005	5% (8/160)	2.6% (2/77)	4% (11/275)	?
Catarpe 1-2 (northern Chile)	Inca	Torres-Rouff and Costa 2006*	3.5% (5/143)	3.2% (2/63)	3.8% (8/210)	0% (0/30)
Catarpe 1 and 5 (northern Chile)	Inca	Lessa 2009	17.2% (5/29)	5.3% (1/19)	12.5% (6/48)	-

* Prevalence calculated based on data presented in that study. Only observable cases were included.

The comparison of the results from the different areas showed that the Ychsma present a similar prevalence of cranial trauma as the Chimú from the North Coast and the Incas from Cuzco. The Ychsma present significantly higher rates of cranial trauma than in northern Chile (odds ratio = 10.04 – 95% CI 3.83-26.29 in males, and odds ratio = 5.40 – 95% CI 1.22-23.87 in females). Conversely, the prevalence of cranial trauma in adults among the Ychsma was significantly lower than among the Tarama and Yauyos from the central highlands (odds ratio = 10.13 – 95% CI 3.51-29.17 and odds ratio = 2.90 – 95% CI 2.05-4.22, respectively). The difference by gender and age was also statistically significant in the Yauyos sample (odds ratio = 3.46 – 95% CI 1.98-6.02 in males, odds ratio = 2.61 – 95% CI 1.38-4.95 in females, and odds ratio = 12.62 – 95% CI 3.37-47.18 in subadults). However, the sample studied by Verano (2003b) was composed of skulls with trephination. This produces a bias in this collection, as the individuals in these samples could be representing those who faced violence, overestimating the real prevalence of violence in the entire population. Moreover, the chronological affiliation of the sample is not clear, so, many of the individuals could have been victims of the turbulent LIP time. The difference by gender was almost statistically significant when the Ychsma and Tarama samples were compared (odds ratio = 3.30 – 95% CI 0.95-11.41 in males, odds ratio = 11.30 – 95% CI 0.98-130.57 in females) (Figure 6.8). However, this difference suggests that violence was higher in the highlands area around Cuzco (the Inca Capital) than on the coast.

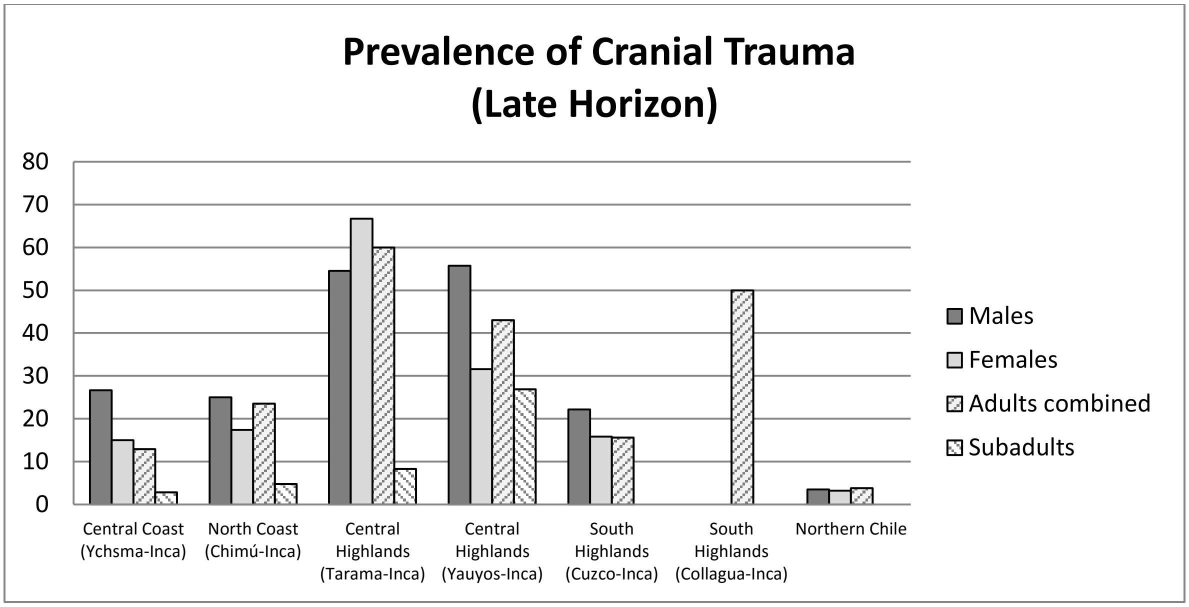

Figure 6.8: Prevalence of Cranial Fractures Found in Different Andean Regions during the LH

6.7.4 Comparison with the LIP

The general prevalence of cranial trauma in the Ychsma territories dropped during the Inca occupation from the LIP: from 44% to 26.7% in males, from 26.5% to 15% in females (33.9 vs. 12.9 in adults combined), and from 12.5% to 2.8% in subadults. However, only the difference in the prevalence of cranial trauma in combined adults was statistically significant (odds ratio = 3.46 – 95% CI 1.93-6.22)[113]. The cases of repetitive trauma also decreased from the previous time period.

In the Caringa site of Pueblo Viejo-Pucará, the prevalence and location of malintent trauma in females was similar than in the Ychsma site of Armatambo (~40%, mostly on the anterior aspect of the skull). However, the findings in males were different (50% of malintent trauma, mostly in the anterior part of the skull in Armatambo, 35% and located both in the anterior and posterior part of the skull in Pueblo Viejo-Pucará).

[113] Male odds ratio = 2.16 – 95% CI 0.91-5.15, female odds ratio = 2.03 – 95% CI 0.83-5.0, and subadult odds ratio = 4.89 – 95% CI 0.82-29.14.

Although the prevalence of violence during the LH was not as high as it was during the LIP, the percentage of fatal cranial trauma in males increased from 0% to 13.3%, although no statistical significance was found (odds ratio = 7.97 – 95% CI 0.47-135.89). Prevalence of lethal cranial fractures in females was similar in both periods (5-6%). The prevalence of perimortem trauma in subadult skulls decreased slightly in the LH from the LIP (from 6.3% to 1.4%).

It seems that more people experienced violent events during the LIP, and that people tended to experience those events more than once during their lives. However, during the Inca occupation of the area, only men faced more lethal encounters than in the LIP (especially those identified as warriors). So, it seems that the Inca government managed to control the widespread conflict in the area. Violence during the Inca occupation was probably only present in persons directly involved (or associated to persons directly involved) in military, and in some cases to the domestic realm.

6.7.5 Conclusion: Violence during the Late Horizon

On the Central Coast, violence was not experienced in equal levels in the different Ychsma *curacazgo*s/*ayllus*. The Caringa and the Lati (coincidently, the two groups with most archaeological evidence for military activities) presented more cranial trauma than in other Ychsma polities (e.g. Malanca, Pachacamac, and possibly Manchay). Cranial trauma in female was significantly higher among the Caringa.

As happened in northern Chile, the prevalence of cranial trauma dropped among the Ychsma during the Inca occupation. However, as was reported in the Cuzco region, lethal trauma increased. The most elevated levels of violence were found among the Ychsma military groups – the Lati and the Caringa (both in males and females). Coincidentally, these groups were located in the areas that permit the access to the central highlands, were the highest and more lethal cases of malintent trauma from the central Andes were registered.

Violence during the Inca occupation of the central coast was less common and generally less lethal than during the LIP, with the exception of males dedicated to military activities, meaning that the strong and centralized organization of the Inca State reduced the exposure to violence for commoners.

6.8 Early Colonial Period: Violence in Puruchuco-57AS03

Murphy and colleagues (2011) and Lund (2009) have shown that individuals buried during the Early Colonial period in the Puruchuco area experienced great violence. However, the sample of Puruchuco-57AS03 – studied independently by Murphy and Gaither, and by Lund, and reanalyzed in this dissertation– does not represent the entire population of the period. The unusual number of males (especially from the adolescent and young adult cohorts), with 50% showing perimortem trauma to the head or thorax, indicates that this sample most likely represents individuals killed in battle. The prevalence of lethal wounds is unusually high, even for post-contact populations. The data available from other Early Hispanic Contact sites show that generally the prevalence of malintent trauma did not surpass 15% (e.g. Cohen et al. 1994; Hutchinson 1991; Klaus 2014; Owsley et al. 1994; Stodder 1994; Ubelaker 1994; and Verano 2011). Looking beyond the limits of the Andes, only the King site (American southeast) (Blakely and Mathews 1990), and an Iroquoian sample (Ontario, Canada) (Pfeiffer and Fairgrieve 1994) demonstrate a prevalence of malintent trauma that reaches higher than 20% (Table 6.18). These samples are recognized to come from societies experiencing extreme levels of violence in the face of colonial expansion

In Puruchuco, low status individuals and "non-soldiers" (persons with few grave goods and without weapons) presented the highest rates of lethal trauma in comparison to middle and high status individuals, and soldiers. Nonetheless, it is possible that the absence of weapons and other important associations in the grave could reflect the hurry in which these individuals were buried, rather than their social status. This idea is supported by the shallow simple pits in which the individuals were interred. The few weapons found with these individuals (especially of maces) could imply that the survivors of the battle carried the weapons of the slain. Thus, even males identified in this study as "non-soldiers" (because they were not buried with weapons) could have been warriors. The presence of females among the victims could be explained, as was in the cases of the killed females from the LH, by their presence on the battlefield (either as warriors or as mere companions). The absence of a sample with a similar proportion of males and females and without children and younger individuals suggests that we can discard the hypothesis of a massacre of a defenseless population.

Evidence of trauma produced by European weapons in the Andean region is scarce and limited to “suspicious cases”. Besides the lesions reported by Murphy and colleagues (2011) and Lund (2009) (both represented in this study), one adult male (possibly a soldier) with a lesion by long-bladed weapon (a sword?) was reported by del Carpio and Vega (2011) for the site of Huantinamarca (Maranga complex, Rímac Valley). A possible gunshot wound (GSW) in a male was reported by Baraybar (2009) in the Inca-Tarama site of Cashamarca (central highlands). Finally, one child from a commingled burial from Pueblo Viejo-Pucará (not included in the sample of this study because it was incomplete) presented a circular defected with internal beveling in the centre of the frontal bone, that could be a GSW (José Pablo Baraybar, personal communication 2015). Given the short term of the Inca occupation in the central coast (about six decades), it is difficult to distinguish the LH occupation from the Early Colonial period within a single site, even using radiocarbon dates (unless a context presents clear non-local artifacts such as glass beads). From the data available, it is almost impossible to assess if the prevalence of malintent trauma increased or decreased generally after the Spanish Conquest occurred, as the Puruchuco-57AS03 represents an extraordinary event of the Colonial central coast (the “Siege of Lima”) and does not represent the whole indigenous population that lived in the central coast under the Spaniards’ rule.

Table 6.18: Prevalence of Cranial/Malintent Trauma Found in Different Regions during the Early Colonial Period

			Prevalence of Cranial Trauma			
Site and Region	**Date**	**Reference**	**Males**	**Females**	**Adults combined**	**Subadults**
Puruchuco-57AS03	1536 AD	This study	50% (8/16)	20% (1/5)	42.9% (4/10)	50% (4/8)
Lambayeque Valley (north coast)	1533-1750 AD	Klaus 2014*	?% (1/?)	0% (0/?)	0.5% (3/641) (including subadults)	?% (2/?)
Chotuna-Huaca Gloria (north coast)	1532-1600 AD	Verano 2011*	0% (0/1)	-	0% (0/1)	0% (0/3)
San Cristóbal and Hawikku (Río Grande Pueblos)	Protohistoric	Stodder 1994	18.9% (20/106)	9.3% (11/118)	13.8% (31/224)	-
Ecuador	Early Historic	Ubelaker 1994	?	?	12% (?/?)	-
Eastern Island		Owsley et al. 1994	3.4% (46/1363) (15 yrs+)	1.5% (19/1255) (15 yrs+)	2.5% (65/2618) (15 yrs+)	-
King (American SE)	16th Century	Blakely and Mathews 1990	?	?	23.5% (23/98)	3.1% (2/64)

* Prevalence calculated based on data presented in that study. Only observable cases were included.

Chapter 7

7 Discussion

This dissertation started with a main null hypothesis: There are no difference in the prevalence and pattern of trauma over time on the central coast of Peru. The first part of this chapter is dedicated to testing this hypothesis. As was done in Chapters 5 and 6, the discussion presented in the first part of this chapter is divided by time periods. The second part of this chapter concentrates on the complementary questions derived from the main hypothesis that were presented at the end of Chapter 3: 1) the relation between sociopolitical changes, natural catastrophes, conflicts over resources and violence, and 2) the effect of violence in specific segments of the population (males, females, subadults, and elite and non-elite persons). Finally, this chapter ends with a reflection on the methodologies employed in this doctoral research.

7.1 A History of Violence: Changes in the Prevalence and Pattern of Trauma in the Peruvian Central Coast

The results of my study clearly led me to reject the null hypothesis: that "there are no difference in the prevalence and pattern of trauma over time". The best alternative hypothesis is that violence, expressed by different patterns of trauma, was not the same through time in the Peruvian central coast, based on the samples available for this study. Some of the expectations presented at the end of Chapter 3 were confirmed while others were not (Table 7.1). These expectations will be explored here.

Table 7.1: Expectations for Malintent Trauma in Each Period vs. Results

Time Period	Expectation	Results
Early Colonial	Dramatic increase of the prevalence of malintent trauma.	Confirmed in this unique sample.
LH (Ychsma-Inca)	Decrease of the prevalence of malintent trauma. The prevalence and severity of malintent factures will be more pronounced in the highlands-coast border, especially among military groups.	Confirmed
LIP (Ychsma)	Similar prevalence of malintent trauma to the MH 3-4	Partially rejected? Prevalence in adults possibly decreased respecting the MH 3-4. However, prevalence increased in subadults. Inconclusive due to small MH 3-4 sample size.
MH 3-4 (Terminal Wari)	Increase of the prevalence of malintent trauma (mostly non-lethal, both in males and females).	Confirmed
MH 1-2 (Late Lima-Wari)	Rise in the prevalence of both lethal and non-lethal malintent trauma among males, and probably among females (with isolated cases in children). Not as intensive as in other regions.	Rejected? Prevalence possibly decreased respecting the EIP B (inconclusive). One of the highest prevalences for the Andean region.
EIP B (Early-Middle Lima)	Decrease of malintent trauma (mostly non-lethal).	Rejected? Prevalence of malintent trauma increased in females and possibly in males. Inconclusive due to small sample size.
EIP A	Rise in the prevalence of (non-lethal and lethal) malintent trauma, also including some females and subadults).	Confirmed
Formative Period (Initial Period / Middle Horizon)	Isolated cases of non-lethal malintent trauma in males, resulting from occasional episodes of interpersonal violence.	Confirmed

7.1.1 Formative Period

The expectation for the Formative period was confirmed: that "there will be isolated cases of non-lethal trauma in males" (see Table 7.1). The results of the samples analyzed in this dissertation and in other studies showed that during the Formative period the levels of violence on the central coast were very low (possibly restricted to isolated cases of male-male physical confrontations), judging by the low prevalence of malintent trauma (<10%) and the lack of archaeological evidence (e.g. fortresses or weapons) for this era. This situation has been reported for other small scale and politically non-centralized societies around the world (e.g. Ferguson 1997, 2011; Fuentes 2004, 2013; Mead 1937). This result is consistent with the idea that during the Formative period, the central coast was occupied by societies without strong social differentiation that did not use violence to coerce people to build the monumental structures that were constructed at this time, such as Cardal, Mina Perdida, and Manchay Bajo (e.g. Burger 1987, 1992, 2009; Burger and Salazar 2009a and b, 2012; Collier 1955; Narváez 2013; Patterson 1983; and Vega-Centeno 2010).

Two kinds of samples from this time period were presented in this study: 1) individuals possibly related to the U-temple tradition (La Capitana and Cardal) and 2) individuals exploiting the seashore and the *lomas* in the Mala-Omas valleys (León Dormido and Asia). Interestingly, the three cases of malintent trauma were found in the U-temple group. This suggests that the constructors and users of these temples, who were buried in tombs that indicated special status (see for example, Burger 1992 and Burger and Salazar 2012) could have faced more violent encounters than the exploiters of the ocean and *lomas* who exhibited almost no social stratification (see Chapter 5). Therefore, it is possible that the occasional non-lethal manifestations of violence were related to the emergence of people of special status or leadership, who might have occasionally used coercion as part of their emerging social roles. However, no statistical significance was found when the prevalences of cranial trauma in adults (sexes combined) of these two groups were compared (odds ratio = 3.0 – 95% CI 0.14-65.79). Future studies focusing in more individuals from this period could help to confirm the possible difference in the prevalence of violence between populations.

The abrupt abandonment of the U-temples at the end of the Initial period and their replacement by non-monumental centers during the Early Horizon has been interpreted as representing a process of socio-cultural crisis and change, which was accompanied by a rise in the population size and tensions between groups (e.g. Burger 1992; Burger and Salazar 2009a and b; Dulanto 2009). During this time, the Chavín religious tradition spread and a militaristic elite emerged through the central Andean region (Burger 1993). This period coincided with some natural catastrophes (at least one Mega El Niño and one tsunami) (Bird 1987; Nials et al. 1979) and the first evidence of fortifications and weapons in the central and south-central coast (e.g. Engel 1987; Patterson and Lanning 1964). An increase of conflict during this period has also been suggested for the north and north-central coast based on archaeological evidence (e.g. Brown Vega 2008, 2009; Ghezzi 2006; Ikehara 2015, 2016; Kaulicke 2010; Pozorski 1987; and Pozorski and Pozorski 1987). However, the current available evidence of malintent trauma in the different regions presented in Chapter 6 suggests that, with the exception of the south coast, the threat of conflict could have been greater that the actual episodes of violence. However, more samples are needed to corroborate this hypothesis.

According to Burger (1993) the fishing communities of the central coast (e.g. Ancón and Curayacu) were not altered by the political, religious, and environmental crisis described above that led to the abandonment of the U-shaped temples. Judging from the lack of evidence of malintent fractures in the entire Formative sequence, the small seashore-*lomas* communities from the Mala-Omas valleys analyzed in this study were likely not affected by this crisis. Unfortunately, besides the small (and commingled) sample from Pampa Chica that Dulanto (2008) reported, there are no skeleton from this period available to study the abandonment of the U-shaped Thus, this research could not explore if this transitional period was associated with an incremental increase in the prevalence of malintent trauma in this region.

7.1.2 EIP A

The expectation for the EIP A: that "there will be a rise in the prevalence of malintent trauma", was also confirmed. The levels of violence increased from the previous time period, especially in males (see Table 7.1). The prevalence of cranial trauma in males of the Lurín Valley was medium to high, probably ranging between 20-40% and it was associated with episodes of warfare (including traditional battles) and intragroup violence (possibly conflict resolutions). The prevalence of cranial trauma in females (12.8%) was lower than in males (28.9%) and was probably related to raiding and female abduction (associated with warfare). Females were also possibly victims of trophy taking and captive killing/capital punishment. With the exception of one female adolescent, no signs of violence were found in subadult individuals. It seemed that during the period within EIP A, in which the burial pits where replaced by the *cistas* in Tablada de Lurín, the levels of violence dropped.

This rise in the prevalence of malintent trauma at the beginning of the EIP A coincided with an era of socio-political changes, with the appearance of clear signs of social stratification, defensive architecture, and weapons (e.g. sling stones and stone and metal maces) in different sites of the Rímac and Lurín valleys (Cárdenas 1999; Maguiña and Paredes 2009; Makowski 2002b, 2009a; Palacios 1988, 2013; Paredes 1984; Stothert and Ravines 1977) and possibly in the Chillón Valley (Agurto 1984; Guzmán 2007; Silva 1996). Mortuary and osteological analyses suggest the presence of coastal and middle of high valley groups occupying the Lurín Valley (Maguiña and Paredes 2009; Makowski 2009a; Pechenkina and Delgado 2006). A rise in the prevalence of cranial trauma in adults was also evident on the north coast and in the Titicaca Basin between the Final Formative and the beginning of the EIP A (see Figure 6.2).

Osteological evidence for warfare was not only present on the central coast, but possibly, also in other regions such as the north and south coast, and northern Chile, as presented in Chapter 6. From these regions, the north (and north-central) coast is the area with the most archaeological evidence for the presence of conflicts (Arkush and Tung 2013).

7.1.3 EIP B

The results of the EIP B sample did not meet the expectation that: "there will be a drop in the prevalence of malintent trauma" (see Table 7.1). Based on the results from Cerro Culebra, the only Early-Middle Lima skeletal collection available for study, it seems that the levels of violence on the central coast rose from the EIP A (from 28.9% to 50% in males, and from 12.8% to 40% in females) to the EIP B. The prevalence of malintent trauma was high in adults (50% in males and females, both sexes suffering non-lethal face-to-face confrontations). This period also has the first case of possible child abuse reported for the central coast. However, no statistical significance was found when the prevalences of cranial trauma of the EIP A and B were compared, possibly because of the small size of the adult sample of Cerro Culebra (n = 14).

In contrast to what was seen in the EIP A, the objects usually found in the funerary contexts (see for example, Barraza 2000 or Stumer 1953) suggest that there was no marked social stratification or evidence of individuals dedicated to military activities (as indicated by a lack of weapons). However, the lack of weapons does not preclude the presence of warfare, as sometimes tools originally created for other purposes can be used as weapons if needed (e.g. Lund et al. 2013; Schulting 2013). Although few weapons from this period have been reported in the region (see for example, Jijón and Caamaño 1949; Palacios 2013), there are some defensive sites in the Lurín and Chillón valleys (e.g. Earle 1972; Patterson and Lanning 1964). The presence of these sites suggest that violence (or at least the threat of violence) was not restricted to Cerro Culebra.

Lumbreras (2011) proposed that during the EIP (4th-5th centuries), the Lima and other cultures of the same period were affected by warfare. Although the prevalence of malintent trauma is higher during the Lima period than in the previous time period, and than in other cultures from the EIP B, it seems that the kind of conflict experienced in the central coast was mostly non-lethal, as the sample from Cerro Culebra suggested. While it is likely that war was present on the central coast during the EIP A, and during the EIP B in the north coast (Moche) and south coast (Nazca), the evidence to support its presence among the Lima (e.g. weaponry, iconography, lethal malintent trauma) is very limited, although it could have been present in the form of raiding. However, it must be acknowledged that this interpretation is limited by the small number of individuals from the central coast available for study.

It is possible that the outburst of violence during the EIP B could have been related to the increment in the size of the population and a subsequent expansion during the end of the

EIP to the Lurín Valley that was suggested by Earle (1972), MacNeish and colleagues (1975), and Patterson and Lanning (1964), which coincided with a period of severe droughts between A.D. 570 and 610 (Middle and Late Lima periods) (Thompson et al. 1985).

7.1.4 MH 1-2

As was the case with the EIP B sample, the results of the MH 1-2 sample did not show the expected rise in the prevalence of malintent trauma (and that this prevalence would be lower than in other regions) (see Table 7.1). On the contrary, the prevalence of cranial trauma in adults decreased from the EIP B (from 50% to 25.8% in males, and from 40% to 16.1% in females), and the prevalence of cranial trauma in the central coast was one of the highest of the Andean region in this time period. The pattern and lethality of the lesions suggested that they were produced mostly in non-lethal face-to-face encounters, although the presence of some lesions in the back of the skull also suggested that some individuals could have been also victims of raiding. The presence of some cases of lethal cranial trauma, possibly sacrificed captives and possibly of trophy heads, also supports the presence of warfare during the Late Lima times.

The MH 1 (Late Lima) was a period of great transformation. Among the changes that the Lima society experienced were the replacement of some monumental centers by new monumental complexes, the decline of the interlocking motif, the changes in the mortuary customs, and the presence of multiple human sacrifices (e.g. Ángeles and Pozzi-Escot 2010; Barreto 2011, 2012; Escobedo and Goldhausen 1999; Falcón 2003; Flores 2005; Goldhausen 2001; Kaulicke 2000; Patterson and Lanning 1964). These changes were possibly related to the transformation of the Lima society into a state-level polity (e.g. Earle 1972; Goldhausen 2001; McNeish et al. 1975; and Marcone 2010). This period coincided with at least one Mega El Niño phenomenon (A.D. ~600-650), which brought strong pluvial precipitations and mud floods to the area that destroyed part of the Lima sites (e.g. Franco 2004; Franco y Paredes 2000; Mauricio 2012; Mauricio et al. 2009; Mogrovejo and Makowski 1999; Olivera 2009, 2015a; Thompson et al. 1985).

The two samples from this period analyzed in this study (Huaca 20 from the Maranga complex and Copacabana), as well as the majority of the individuals used as complementary data (and that were reported by other authors) belong to the MH 1 (Late Lima), the period in which the Wari society started to exert influence over the greater Andean region. There is almost no information available for MH 2 individuals (the period of the Wari consolidation in the coast, according to Gierz and Makowski 2014). Thus, the results of my analysis for the first half of the MH ("Wari development and diffusion") refer almost exclusively to the time in which Wari was expanding (and becoming "prestigious"), but had not yet become fully established on the central coast. This mix of socio-political changes and natural disasters, and the expansion of a stronger state did not translate into a rise of the prevalence of malintent trauma. However, other lines of evidence, such as the presence of more cases of perimortem cranial trauma, trophy heads (Jijón y Caamaño 1933, 1949; Paredes 1998, 1999), possible sacrifice of warriors, and weapons as grave goods (e.g. Gayton 1927; Kauffmann 1994; Kaulicke 1997; and Ravines 1977) suggests that warfare did increase during the MH 1 in the central coast. Moreover, warfare seems to have been more common in the central coast than in other Andean regions (with the exception of the south highlands) based on studies of cranial trauma prevalence that were presented in Chapter 6 (see Figure 6.4). Although more individuals from the EIP B would be required to confirm the drop in the prevalence of malintent trauma during the MH 1, the compilation of data suggests that the manifestations of violence became more complex (including lethal encounters) and more ritualized (e.g. sacrifices, trophy taking) than before. Thus, it is possible that when the Wari reached the central coast, they found a society in which warfare was present, and that the Lima learned new ways of conducting warfare as a consequence of the direct or indirect influence of the Wari.

The currently available data do not allow one to see the changes in the prevalence of malintent trauma associated with the Wari consolidation in the central coast. Although the very low prevalence of cranial trauma found in Ancón (<5%) suggests that during the Wari occupation/influence, the levels of violence likely dropped at least in part of the former Lima territory, the exact chronological assignment of this sample to a specific MH sub-phase is not possible (see Rojas-Sepúlveda and Dutour 2009). However, the apparent lack of Wari people from the highlands in the cemeteries at Ancón (e.g. Pink 2013; Slovak et al. 2009) suggests that the Wari did not militarily invade or promote a migration of Wari population (which could have produced tensions and conflicts with the locals) in the area.

7.1.5 MH 3-4

The expectation for the second half of the MH - the Terminal Wari/Imperial collapse period: that there would be "an increase of the prevalence of malintent trauma from MH 1-2"), was confirmed (see Table 7.1). There was a statistically significant increase of the prevalence of cranial trauma in males (from 25.8% to 80%). More than half of the adults from Ancón (especially males) suffered malintent trauma (both non-lethal face-to-face encounters concentrated in the nasals bones and deadly events, possibly related to warfare). The large number of MH 3-4 tombs contain weapons (see Kaulicke 1997) supporting the idea that some males from Ancón during this time period were engaged in warfare.

The final part of the MH was a period of great socio-political change led by the collapse of the Wari state (and the possible abandonment of Huari, its capital city) and the loss of prestige of the Pachacamac oracle on the central coast (Menzel 1964; Shimada 1991). Flores (2005) has proposed that this situation would likely have produced political disorganization and anarchy. This time of crisis can be seen through the lower quality of the Epigonal ceramic styles (Shimada 1991), the rise of the prevalence of malintent trauma shown in this study, and the changes in the cranial modification patterns detected by Slovak (2007) in the Ancón osteological collection, which, in her opinion, was a reaffirmation of the local coastal identity, in opposition to the highland, Wari influence. This Wari rejection continued during the LIP, as was seen in the looted elite Wari funerary contexts that were replaced by simple Ychsma burials at the site of Huaca Pucllana (Flores 2005).

Although it seems that the prevalence of cranial trauma in males was higher on the central coast than in the Wari heartland and northern Chile (the other areas for which comparable data exist), the small number of male individuals at Ancón (n = 5) available here makes these statements inconclusive. However, these three regions showed a rise in the prevalence of cranial trauma in adults (both in males and females) with respect to the MH 1-2. This evidence coincides with other studies that indicate that violence escalated in periods of socio-political instability such as the collapse of an Empire or other complex societies (e.g. Cahill 2010; Covey 2008; Kurin 2012, 2014; Tainter 1988; Yoffee 2005).

7.1.6 LIP

The expectation for the LIP: that this period would demonstrate "similar prevalence of malintent trauma to the MH 3-4", was partially rejected (see Table 7.1). The prevalence of malintent trauma slightly decreased in males and adults combined with respect to the MH 3-4 (from 80% to 44% and from 55.6% to 33.9% respectively), while the prevalence in females stayed around 25%. However, malintent trauma in subadults increased from 0% to 12.5%. This period was a time in which violence and warfare were present in different Andean regions, according to several different authors (e.g. Arkush and Tung 2013; Brown Vega 2008, 2009, 2010; Brown Vega et al. 2011; Nielsen 2009; Parsons and Hastings 1988). Despite this slight decrease in the prevalence of malintent trauma in adults, the Ychsma from the central coast presented one of the highest prevalences of cranial trauma in the central Andean region during the LIP.

It is possible that the small number of adults of Ancón (n = 9) produced an artificially high prevalence of malintent trauma for the MH 3-4. Moreover, most of the lesions were limited to healed broken nasal bones, which contrasts to the pattern of violence (lethal and non-lethal) targeting the head and thorax that was found in approximately one half of the individuals older than 12 years from the LIP site Armatambo- "22 de Octubre".

The osteological analysis and other lines of evidence suggest that on the central coast violence remained high (and possibly became more lethal and repetitive) during the LIP following its rise in MH 3-4. For example, in the middle Rímac Valley the settlement pattern changed to a more defensive placement system (from the bottom of the valley to the top and sides of the hills) (Silva 1992), while possible fortresses and defensive sites appeared in the Chillón Valley (Agurto 1984; Guzmán 2007; Silva 1996). The defensive location and planning of the sites was accompanied by the presence of weapons in diverse sites such as the Fortaleza (Fortress) de Collique (Correa 1992), and Plaza de los Peregrinos of Pachacamac (Shimada et al. 2004). The possible killing of at least one prisoner was detected in Armatambo (an activity that was also represented in a sculptural vessel from the same site (Díaz 2004). There is also evidence for a possible massacre during the Late Ychsma phase at Huaca 33 (Maranga Complex) (Barreto 2014).

According to Vallejo (2008), it seems that the Early Ychsma phase was a time of cultural isolation and political change due to the disintegration of the society into smaller *curacazgos*, the pressure of other groups and a severe drought (between A.D. 1250 and 1310) that was noticed by Thompson and colleagues (1985). During the Middle and Late Ychsma phases, the Ychsma developed to a more complex society. Judging from the prevalence of cranial trauma in two cemeteries from Armatambo ("Héroes del Pacífico", from the first half of the LIP and "22 de Octubre", from the latest part of the LIP), the levels of malintent trauma in males were high (>30%) during the entire LIP. The higher prevalence of malintent trauma in "22 de Octubre", as opposed to "Héroes del Pacífico", as well as the possible presence of at least one episode of massacre (Huaca 33 – Maranga Complex) suggest that there was an increase of violence during the Late Ychsma period possibly related to the expansion of the Inca Empire.

7.1.7 LH

The expectation for the LH was confirmed: that "there will be a decrease in the prevalence of malintent trauma, and malintent trauma will be more pronounced among military groups". (see Table 7.1). The prevalence of cranial trauma actually dropped among the Ychsma during the Inca occupation, although lethal trauma increased (especially among males from the military groups – the Lati and the Caringa).

Some ethnohistoric and archaeological evidence indicates generally that the Inca did not employ a military force to conquer the coastal polities; rather they used a set of non-violent strategies (including negotiation with the elites, the subtle imposition of their cult, and the movements of people from other regions) to achieve their goals (e.g. Conlee et al. 2004; Cornejo 2000; D'Altoy and Scheiber 2004; Eeckhout 2004b; Garcilaso (1991 [1609]; Menzel 1959; Morris 1998; Rostworowski 1978; Shimada 1991; and Shimada et al. 2010). The hypothesis of a relatively peaceful conquest of the central coast is corroborated by the small number of defensive sites in the region (see for example, Feltham 1984; and Silva 1996) and the relatively low prevalence of cranial trauma (~25% in males, ~15% in females). These prevalences are very similar to the those reported for Cuzco and the north coast during this time period, and were significantly lower than the results of the central highlands and south highlands (Inca-Collagua), indicating that violence (especially related to military actions) was less common on the coast and in the Inca core than in the peripheral areas of the highlands.

However, the diversification of the types of weapons in the area (e.g. axes, *boleadoras*, etc.) and the multiplication of sites with weapons (see for example Barraza and Vega 2011; Cock and Goycochea 2004; Frame et al. 2004; Makowski 2002a, Ravines 2000; Silva 2014; Squier 1978 [1869]; Vetter 2004; Vetter and Villacorta 2001; Wiener 1993 [1880]) suggest that military coercion was employed in the central coast in this time period when necessary. Moreover, the ethnohistoric information about the use of military force in the borders of the Ychsma territories (the conquest of the Collis from the Chillón Valley and the quelled rebellions in the southern region) (Cornejo 2000; Rostworowski 1989) and the archaeological evidence for a violent abandonment of Panquilma (middle Lurín Valley) (López-Hurtado and Nesbitt 2010) suggest that violent actions were taken at the Ychsma periphery. The osteological analysis presented in this study suggests that these actions were performed (and suffered) mainly by people associated with military activities (male warriors and their possible female companions). Commoners experienced a decrease in the levels of violence with respect to the LIP, suggesting that the strong and centralized organization of the Inca State led to a “regulated form” of violence”.

7.1.8 Early Colonial Period

The expectation that for the Early Colonial period there would be a dramatic increase in the prevalence of malintent trauma based on the expectation of conflict with the Spaniards, was confirmed in the sample composed of the individuals who were interred superficially in the 57AS03 cemetery (Puruchuco-Huaquerones) (see Table 7.1). The unusually high number of males (especially from the adolescent and young adult cohorts) affected by lethal trauma to the head or thorax indicates that they were killed in battle, probably during the Siege of Lima, as was already proposed by Murphy and colleagues (2010) and Lund (2009). However, the scarce evidence of lesions produced by European weapons elsewhere on the central coast suggests that cases like Puruchuco-57AS03 were exceptional. It is possible that, as historian Juan José Vega (1992) stated, many of the battles were between indigenous troops who stayed loyal to the Inca, and indigenous troops (using Andean weapons) who fought for the Spaniards. Nonetheless, it is also possible that other gunshot wounds or lesions produced by other European weapons have previously been overlooked.

7.2 The Causes and Effects of Violence in the Peruvian Central Coast

Following the assessment of the main hypothesis, new questions arose. At the beginning of this research, I proposed that the greatest prevalences of violence would be found in times of dramatic cultural changes and climatic changes, especially during the expansion of the Wari Empire and the Spanish conquest (the Middle Horizon 1 and the Early Colonial period). Additionally, I expected that violence would affect male adults and low status individuals in a greater proportion than other social segments. However, the evidence presented in this study contradicts some of these ideas.

7.2.1 Violence and Socio-Political Changes

The first manifestations of occasional non-lethal violence were found during the Early-Late Formative period, coinciding with the proposal by several authors (e.g. Burger 1987, 1992, 2009; Burger and Salazar 2012; Collier 1955; Narváez 2013; Patterson 1983 and Vega-Centeno 2010) that during this period the central coast was occupied by non-complex societies that did not have strong social differentiation and did not use violent coercion. This very low to low prevalence of malintent trauma in adults (~0-15%) was also detected in other Early-Late Formative sites from different Andean regions such as the north coast, the north highlands, northern Chile, and the Titicaca Basin, suggesting a comparable level of sociopolitical complexity throughout the Andes during this time.

The emergence of fortified/defensive sites and weapons in different parts of the central Andean region suggests that the first manifestations of warfare appeared after the fall of the Chavín religious influence (Final Formative to the beginnings of the EIP). This evidence is supported by the rise of the prevalence of malintent trauma in the central and north coasts. Nevertheless, more skeletal samples are needed to corroborate this hypothesis. In average, the prevalence of malintent trauma in adults during this period was moderate (20-35%) in the north, central, and south coasts, and in the Titicaca Basin[114].

This study expected to find a correlation between presence/invasion of stronger states and an increase in the use of violence (due to the use of military coercion by the expanding state). However, the observation of the peaks of cranial trauma (using the data generated in this research and the available published/unpublished studies) suggests that during the presence of the Wari and the Inca Empires, two expansionist and centralized states, the prevalence of cranial trauma actually dropped on the central coast. The highest levels of violence were detected in the periods that immediately preceded the expansion of the Wari and Inca Empires: the Middle Lima and the Terminal Wari-Ychsma times (Figure 7.1). It is likely that these time periods were characterized by increasing internal and external tensions that laid the groundwork for domination by the external state-level polity.

From its first occurrence during the EIP A, fatal malintent trauma stayed under 10% in most of the pre-Hispanic sequence. The exception was the MH 3-4 (or "Terminal Wari" period), in which perimortem trauma affected 20-25% of the adults. Nevertheless, this unusually high rate could relate to the small size of the sample (n = less than 10 individuals). In an alternative interpretation, lethal trauma during the MH 3-4 could be restricted to isolated cases, as perimortem trauma was found in only two individuals from this period. More than 10% of the males from the Inca period also showed lethal cranial fractures (especially frequent among those identified as warriors) (Figure 7.2).

[114] The Titicaca Basin was not part of the Chavín area of influence.

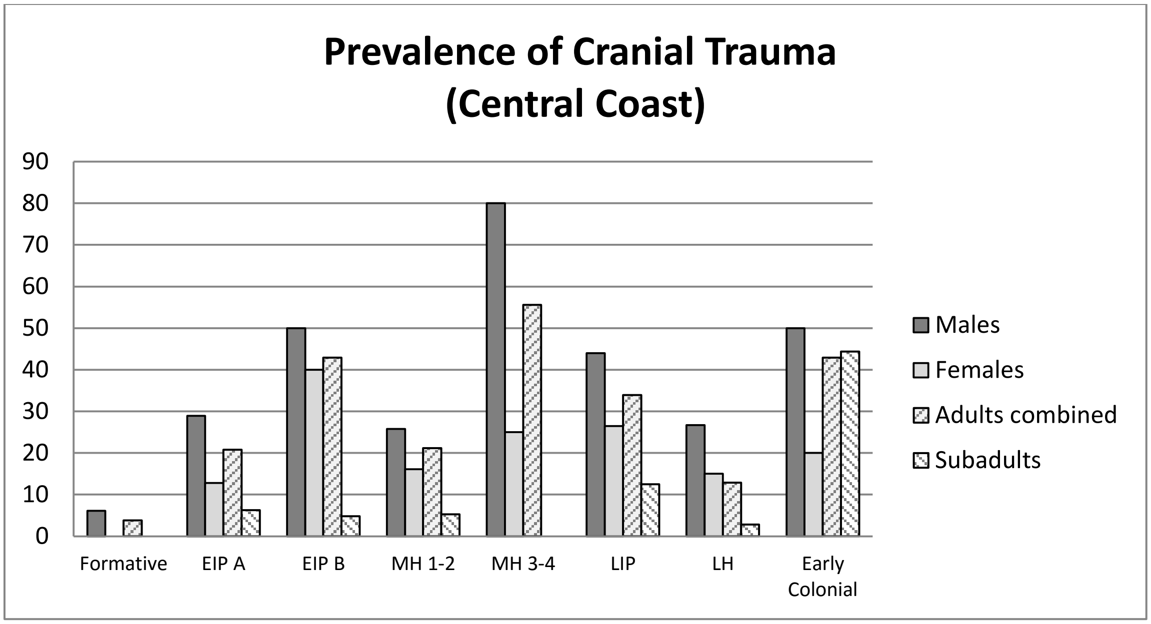

Figure 7.1: Changes in the Prevalence of Cranial Trauma through Time on the Central Coast

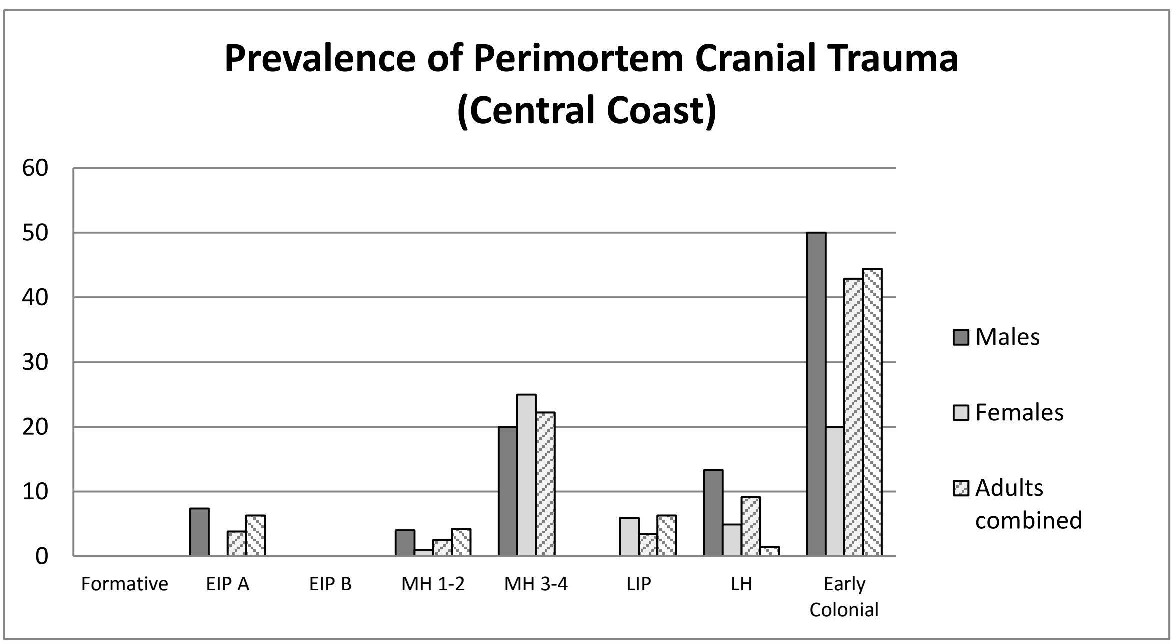

Figure 7.2: Changes in the Prevalence of Perimortem Cranial Trauma through Time on the Central Coast

It seems that, at least in the central coast, the strong states managed to control the violent episodes that characterized the previous periods, and that during the Inca period, lethal encounters were present only in warrior groups. Only during the Spanish conquest, did the prevalence of malintent trauma increase. However, the sample presented in this study reflects a special event of the contact period (the Siege of Lima) and probably did not represent the entire population of the central coast during this period.

The effects of the Empires on the level of violence were not the same in all the Andean regions mentioned in this study. A slight increase in the prevalence of cranial fractures was found on the south coast/highlands and in northern Chile associated with the expansion of Wari and Tiwanaku, respectively. The different prevalences of malintent trauma observed in different MH 1-2 regions are consistent with the idea that the Wari Empire employed diverse strategies of expansion, not all of them including military coercion (e.g. Isbell 2010; Jennings 2010; and Schreiber 1992).

The north coast also experienced a slight increase in the prevalence of cranial trauma during the Inca control. Major cranial trauma in adults and minor cranial trauma in females also increased in the Cuzco region (specifically outside of the immediate capital area) during the Late Horizon (Andrushko and Torres 2011). However, in northern Chile, Torres-Rouff and Costa (2006) reported a decrease in the levels of violence during the same time period. These results are consistent with the idea that the Inca used different strategies to conquer territories (e.g. military force, negotiation, and alliance), depending on the type of organization and economic worth that each society exhibited before being annexed by the Empire (Conlee et al. 2004; Covey 2000; D'Altroy 1992; D'Altroy and Scheiber 2004; Hyslop 1985, 1990; Malpass 1994; Menzel 1959; Morris and Covey 2006).

In sum, it seemed that two socio-political changes were involved in the escalation of violence and the appearance of warfare on the central coast: the emergence of social inequalities and a warrior elite or leadership (possibly starting during the Initial Period but consolidated during the EIP A, (as was proposed by Makowski 2002b, 2009a for Tablada de Lurín and Ikehara 2015 for the end of the Formative period from the north-central coast) and the socio-political crisis produced after the fall of a previous social order (MH 3-4/LIP and possibly the EIP B and the Early Colonial period). Although the presence of the pre-Hispanic Empires seemed to have a positive effect by reducing the prevalence of malintent trauma in the central coast, that was not true for the entire Andean region.

7.2.2 Violence and the Competition for Resources

Another hypothesis formulated in this research had to do with the role played by the restriction of resources in the presence of violence.

The central coast area is located in a desertic area (although not as desertic in Pre-Columbian times as it is today) (see for example, Moutarde 2006 and Rostworowski 1981), where water has always been a very valuable resource. One might therefore, expect conflict to accompany disputes over irrigation control. Irrigation systems were built from the Early Horizon (Narváez 2013) in order to expand areas for cultivation. The polities of the valleys of Lima were organized according to their irrigation systems, at least from the LIP (Eeckhout 2004a; Rostworowski 1978), but it is possible that an irrigation-based organization was practiced from the earliest times.

Strong El Niño phenomena ("Mega Niño") had (and continue to have) a great impact on agriculture, generally increasing the level of the coastal rivers and producing mudflows. Evidence for Mega-Niños has been established for the end of the Late Formative Period (~500 B.C) (Nials et al. 1979), and the beginnings of the MH (~A.D. 600) (e.g. Kaulicke 2000; MacNeish et al. 1975; Mauricio 2012; Mauricio et al. 2009; Olivera 2009, 2015a; Shimada 1991; Shimada et al. 1991 Thompson et al. 1985). However, none of these periods is associated with a particularly high prevalence of malintent trauma as was demonstrated in this study.

Although a Mega El Niño associated with mudflows did not have a direct effect on the levels of violence in this region, the *lack* of water apparently did. The LIP, already established as an era of extended violence (which also affected the central coast), has previously been associated with environmental desertification as a result of a relatively long period (approx. 40 years) of lack of precipitation in the highlands (Thompson et al. 1985; Vallejo 2008). Another severe drought period was detected by Thompson and collaborators (1985) in the time of the transition between the Middle and Late Lima periods, and could have coincided with the time in which the people from Cerro Culebra (the EIP B sample analyzed in this study) lived. Thus, both drought periods (that could have also been related to strong El Niño phenomena) could have been associated with the highest increments of the prevalence of malintent/cranial trauma on the central coast.

Other evidence for disputes over resources is seen in the elevation in the levels of violence in the EIP A (possibly related to conflicts between coastal and middle valley communities), and the presence of more malintent trauma and people identified as warriors in the Ychsma-Inca groups that were located in the areas closer to the middle valley (*chaupiyunga*). The *chaupiyunga* was considered an important area in pre-Hispanic times, not only for its strategic location connecting the littoral and the highlands, but also for its coca production. The Lurín Valley attracted the attention of the Inca not only for the prestige of the oracle of Pachacamac, but also for the coca crops of the *chaupiyunga* (Cornejo 2000; Feltham 1984, 2005; Rostworowski 1977, 1989, 1999).

To sum up, two possible triggers for the fight for resources were present in the pre-Hispanic Peruvian central coast: water and food scarcity as the result of severe droughts (LIP and possibly during the end of the EIP B), and conflicts over the control of the mid-valley region, the *chaupiyunga* (LH and possibly the EIP A).

7.2.3 Violence and Gender

An important inquiry for the purpose of this research was whether violence was experienced in the same manner by the two sexes on the central coast. My investigation suggests that, as was expected, violence generally affected males and females in different manners. Therefore, it is possible that these results also reflect gender differences in the exposure to violence, based on socially constructed roles distinctions related to gender.

As is usually seen in the vast literature of bioarchaeological investigations of violence cited in this study (e.g. Fry 1998; Guilaine and Zammit 2005; Paine et al. 2007; Walker

1997, 2001, etc.), males consistently presented more cases of malintent trauma than females. For most of the sequence, the prevalence of malintent/cranial trauma in males was ~5-15% higher than in females. Only in two time periods was the difference in the prevalence of malintent/cranial trauma between males and females much higher: the MH 3-4 (80% vs. 25%) and the Early Colonial period (50% vs. 20%).

Although variations in the prevalence of cranial trauma were similar in the two sexes from the Formative to the MH 1-2, the fall of the Wari Empire (MH 3-4) marked the beginning of a time in which the levels of violence experienced by females stayed about the same (~15-25%) until the end of the chronological sequence (Figure 7.3). However, the small size of the EIP B and MH 3-4 samples could have affected these rates, overestimating the true prevalences of violence.

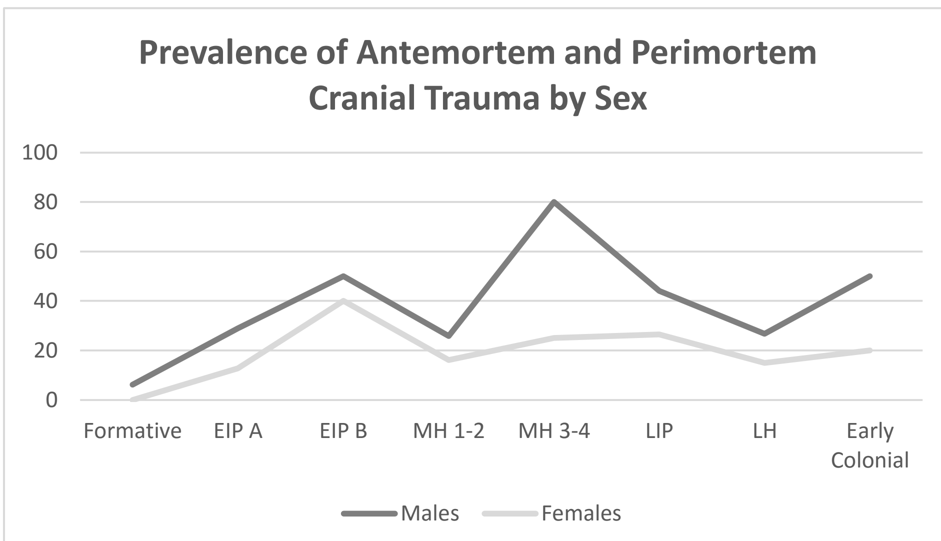

Figure 7.3: Changes in the Prevalence of Antemortem and Perimortem Cranial Trauma by Sex on the Central Coast

The location, severity, and MNEv identify in the samples studied here, suggest that in some time periods, males and females faced the same manifestations of violence, but in others they did not. While warfare is evident in the central coast from the EIP A, it affected both sexes differently. There is evidence (e.g. lesions and weapons) that supports the presence of males as warriors (and thus, in battles) in the EIP A, MH 3-4 and LH. The presence of possibly sacrificed captives and trophy heads that likely belong to the Late

Lima period suggests that warfare was also present during the MH 1-2. There is also evidence that during that period, both males and females were occasional victims of raiding, as they were (but more frequently) during the EIP B.

After the arrival of the Wari, the evidence for raiding became more elusive, but it could have occurred up to the LH. During the LIP males and females seem to have been victims of warfare in a similar manner: repetitive face-to-face confrontations (in many times lethal) and massacres. During the LH, some females possibly participated as individuals who accompanied their partners into battle (or even eventually participate directly as warriors).

Were those battles "real" or ritual? The evidence collected in the present research cannot exclude either of these options. The usual pattern of violence recorded here (non-lethal skull fractures and low prevalence of perimortem injuries) has been associated with ritual battles (e.g. Arkush and Tung 2013; Lambert 1997, 2002; Tung 2012b; and Walker 1989, 1997). However, the MNEv and number of fractures do not support this hypothesis. A higher number of repetitive traumatic lesions (or at least, of multiple antemortem wounds) should be expected in these cases under the ritual model, as ritual battles in the Andes take place seasonally.

Generally, the prevalence of lethal trauma was similar between males and females. Only in three time periods (EIP A, LH, and Early Colonial) was the prevalence of lethal cranial trauma in males clearly higher than in females, likely representing periods during which deadly battles mostly affected male warriors. Conversely, females presented more perimortem cranial trauma during the LIP (Figure 7.4). However, when subadults with estimated sex and lethal thoracic trauma are also considered, there is no difference between the sexes in the LIP, as these lesions were found in approximately half of the males and females (and affecting mostly the anterior aspect of the skull and the sternal end and/or the sternal one-third of the 4^{th}-7^{th} ribs). It is possible then, that both males and females were engaged equally in the various violent encounters that were present during the LIP. Similar prevalences of malintent/cranial trauma between males and females were found during the Middle Horizon (both MH 1-2 and MH 3-4), suggesting that both sexes were the occasional victims of lethal violence.

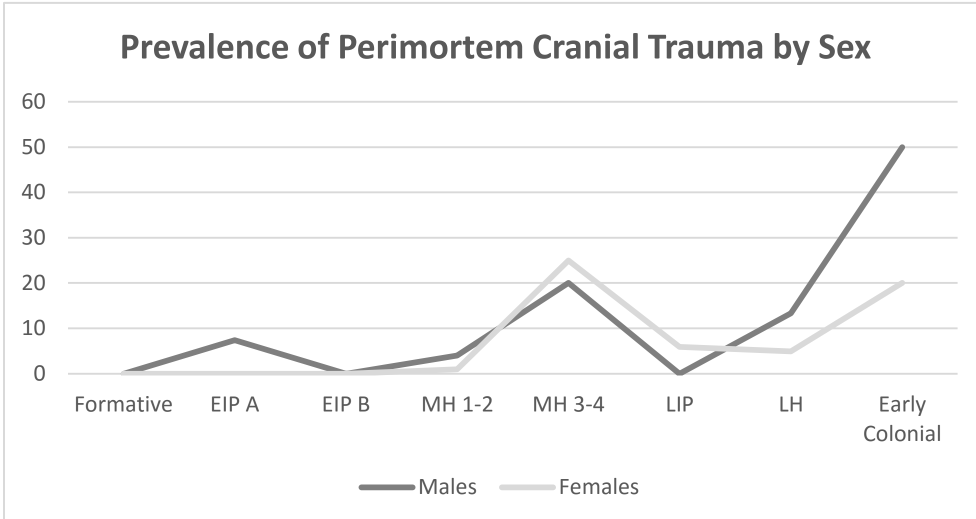

Figure 7.4: Changes in the Prevalence of Perimortem Cranial Trauma by Sex on the Central Coast

Suspicious cases of domestic abuse were scarce. Only one female from Armatambo ("22 de Octubre") and a female from the Ychsma-Inca site of Rinconada (Salter-Pedersen 2011a) show multiple rib fractures in diverse stages of healing. Does that mean that domestic abuse was rare in the pre-Hispanic central coast? It is hard to tell. The analysis of the remains of 23 women from a modern south highlands community (who were killed in a single event during the Peruvian internal conflict in the 1980s) showed no cases of antemortem cranial, parry or rib fractures[115]. Domestic abuse within this community was chronic, in such levels that women traditionally wore metallic rings to fight back against their husbands, as I concluded from my conversations with the relatives of some of the victims. The direct testimony from a relative informs that at least one of these women suffered domestic violence many times. However, the only antemortem traumatic lesions recorded in this sample were four cases of lesions in the upper long bones, most probably

[115] The information was taken from the recording forms stored by the Peruvian Forensic Anthropology Team (EPAF). The name of the case cannot be released due to confidentiality agreements.

related to accidents. This case study demonstrates that even in contexts in which domestic abuse was demonstrably frequent, its presence could be osteologically invisible.

In sum, males and females usually experienced violence in different manners. From the Formative period, males were consistently more affected by violence (lethal and non-lethal) than females. Evidence of the participation of males as warriors has been recorded for the EIP A, MH 3-4, the LH, the Early Colonial period and likely in the MH 1-2. The effects of violence on females can be divided in two time blocks: the pre and the post-Wari era. In the pre-Wari (and Wari) period, the prevalence of malintent/cranial trauma in females (some of them, likely produced by raiding) clearly followed the variations of the prevalence in males. After the collapse of the Wari Empire, the prevalence of malintent/cranial trauma in females stayed about the same (between 15 and 25%) for the rest of the sequence (although a slight increase during the MH 3-4 and the LIP was detected). It seems that in the post-Wari era raiding was rare and females could have been incidental victims of warfare (especially those accompanying warriors). Evidence of domestic abuse is limited to the LIP and LH, although the difficulty in the detection of this kind of violence in the skeleton opens up the possibility that domestic violence occurred earlier.

7.2.4 Violence in Subadults

How violence affected adolescents, children, and infants was also examined in this research. The results showed that, except during the LIP, the prevalence of cranial trauma in subadults did not surpass 10% in the entire pre-Hispanic sequence. A similar prevalence of malintent/cranial trauma below 10% was found the different Andean regions presented in this study, with the exception of the south highlands during the MH 3-4 and the LIP and the Yauyos-Inca (LH). Only during the Early Colonial period, in the event known as the “Siege of Lima”, did subadults show a similar prevalence of cranial trauma as adults on the central coast (Figure 7.5).

The first case of malintent trauma in subadults was seen in the EIP A, a female adolescent, was a possible victim of captive killing or capital punishment, as was concluded from the extreme violence that the skeleton exhibited (mutilation of forearms and multiple fractures in the face, vault and thorax) and her unusual pattern of burial.

Some scholars (e.g. Gaither 2012; Lewis 2007; Tung et al. 2016) have proposed that violence in children should increase during periods of social, cultural, and environmental stress. However, malintent traumatic lesions in children and infants were limited to three cases: an infant from the EIP B (suspected case of child abuse), one young child from Pueblo Viejo-Pucará, and one older child from Puruchuco. Álvarez (2013) also reported one infant and one young child from the Late Lima site of Catalina Huanca presenting perimortem cranial trauma. However, as we do not have appropriate contextual information, it cannot be ruled out that these individuals could have been victims of sacrifice. It is also possible that the reason for the lack of evidence for child abuse is because infants and children are poorly represented in this study, or because victims of abuse were not buried in the usual cemeteries or places for body disposal.

The adolescent stage was the subadult cohort that was most visibly affected by violence. The LIP and the Early Colonial were the two periods in which they presented their highest peaks of malintent trauma. The increase of the prevalence of violence in subadults (related to cultural conflict) during the Early Contact period was previously noticed by Gaither (2012) for the site of Puruchuco-Huaquerones. The presence of malintent trauma in the teenage cohort, which showed a similar pattern of trauma as the older cohorts, suggesting that adolescents were, violence-wise, treated as adults, and that they could have been involved in the same manifestations of warfare (i.e. battles and raiding) as the adults. For adolescents, the LIP and the Early Colonial were the two periods of greatest violence.

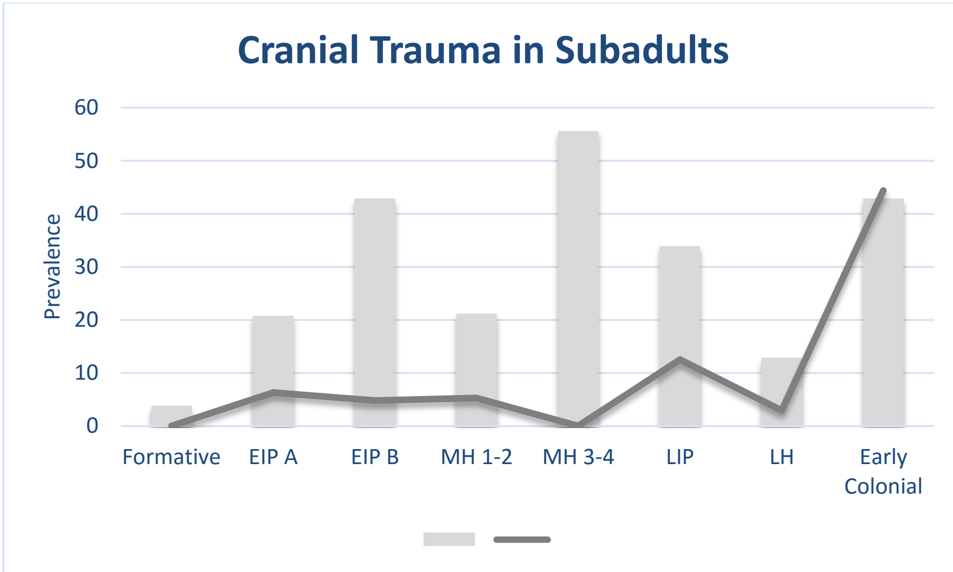

Figure 7.5: Changes in the Prevalence of Cranial Trauma in Subadults on the Central Coast

7.2.5 Violence and Social Status

The final expectation of my research was that low status individuals would have been more exposed to violence than high status individuals. The results suggest that indeed, they were, at least in Huaca 20 (MH 1), Armatambo (LIP), and Puruchuco-57AS03 (Ychsma-Lati during the Inca occupation) (Table 7.2). Something similar was found by Torres-Rouff and King (2014) in sites from the Middle Period and by Murphy (2004) in Inca individuals from Puruchuco-Huaquerones.

Table 7.2: Prevalence of Malintent Trauma in Adults by Social Status

Site	Low Status	Middle-High Status
Puruchuco-57AS03 (Early Colonial)	38.9% (7/18) (perimortem)	40% (2/5) (perimortem)
Puruchuco-57AS03 (LH)	28.6% (4/14) (perimortem)	0% (0/38) (perimortem)
Pueblo Viejo-Pucará (LH)	-	37.8% (17/45)
Armatambo (LIP)	55.6% (5/9)	40% (8/20)
Ancón (MH 3-4)	0% (0/2)	80% (4/5)
Copacabana (MH 1)	57.1% (4/7)	-
Huaca 20 (MH 1)	32.4% (11/34)	20% (3/15)
Cerro Culebra (EIP B)	41.7% (5/12)	-
Tablada de Lurín (EIP A)	50% (3/6)	33.3% (3/9)
Asia-León Dormido (Formative Period)	0% (0/18)	-
La Capitana (Formative Period)	13.3% (2/15)	-

However, the opposite situation seems to have happened in other Andean regions. For example, Farnum (2002) and Muno (2009-2010) reported higher prevalence of violent and accidental trauma among Sicán middle and high status individuals than among the commoners. Nevertheless, this sample is problematic, as the great majority of the individuals were females. Thus, the Sicán capital is not a good representation of the entire Sicán society. Similarly, Tung (2014b) stated that Wari elite presented more cases of cranial trauma, based basically in the Huari-Cheqo Wasi sample. However, the highest rates of cranial trauma in the Huari-Cheqo Wasi collection can be related to social changes, since these skeletons corresponded to the decline period of Wari as an Empire.

In summary, the results of this doctoral research clearly reject the null hypothesis: that "there are no differences in the prevalence and pattern of trauma over time". Violence, expressed by different patterns of trauma, was not the same throughout time in the Peruvian central coast and in the other Andean regions. Following the rejection of the null hypothesis, two complementary questions were addressed: 1) Was there a relation between sociopolitical changes, natural catastrophes, fights for resources and violence? and 2) How did violence affect specific segments of the population (males, females, subadults, and elite and non-elite persons)? It was proposed that the changes in the prevalence of malintent trauma were strongly correlated with specific socio-political and climatic events, such as the expansion of the Wari Empire and the Spanish conquest, and Mega El Niño events. It was also proposed that males (especially low status individuals) were the most affected by the diverse manifestations of violence. In general terms, these expectations were confirmed, although some unexpected findings were also observed.

Two socio-political changes were most likely involved in the escalation of violence in the central coast: 1) the emergence of social differentiation and a warrior elite (possibly starting during the Initial Period but consolidating during the EIP A) and 2) the socio-political crisis produced after the fall of a previous social order (MH 3-4/LIP and possibly the EIP B and the Early Colonial period). Increases in the prevalence of malintent trauma were also related to competition for resources detected in the central coast region: severe droughts (LIP and possibly during the end of the EIP B, that may have been related to Mega El Niño events) and competition for the control of the mid-valley or *chaupiyunga* (LH and possibly the EIP A). The expected connection between flooding and mudflow periods related to Mega-Niños and increased prevalence of malintent trauma was not found.

It was also established that males, females and subadults usually experienced violence in different manners. Males were consistently more affected by violence than females, especially those identified as warriors. Until the time of the Wari (MH 1-2), the prevalence of malintent trauma in females (some of them, possibly produced by raiding) followed the ups and down of the prevalence in males. However, after the Wari collapse, the prevalence of malintent/cranial trauma in females stayed about the same (between 15 and 25%) for the rest of the sequence, as raiding became rare. After the collapse of the Wari Empire, females could have been incidental victims of warfare (especially those accompanying warriors). Evidence of domestic abuse was scarce (and limited to the LH), but it is possible that domestic violence occurred earlier, as this kind of violence is difficult to detect in the skeleton, as the analysis of the forensic case study illustrated. Subadults were often not affected by violence. Malintent trauma in subadults rarely surpassed 10%, and affected adolescents mostly, especially in periods of greatest violence (the LIP and the Early Colonial period). This evidence indicates that adolescents could have been considered (or treated as) adults in terms of their exposure to violence. Only one suspicious case of child abuse was detected in the EIP B sample. Finally, the expectation that low status individuals would have been more exposed to violence was confirmed, at least for the MH 1, the LIP, and in the LH.

7.3 Methodological Considerations

This doctoral dissertation has proposed the integration of five variables to study violence: age cohort and social status of the individual, the most probable cause, the lethality, and the Minimum Number of Events (MNEv) associated with the lesions.

With regard to age cohorts, in modern biological anthropology, the word "subadult" usually refers to individuals who have not reached skeletal maturity (e.g. Chamberlain 2006; Hoppa and Vaupel 2002; Thompson and Nelson 2011), so adolescents in general are part of the biological concept of "subadult". Some scholars (e.g. Andrushko 2007; Kellner 2002; Pacheco and Retamal 2014; and Torres-Rouff and Costa 2006) follow this biological classification, considering adolescents as subadults in their studies of Andean violence. However, other researchers (e.g. Andrushko and Torres 2011; Kurin 2014; Murphy et al. 2010; Rojas-Sepúlveda and Dutour 2009; Tung 2012b, 2014b; Verano 1986; Verano et al. 2008) group adolescents (or even late children) with adults. As sex is not always possible to estimate in individuals between 15-18 years (especially in poorly preserved skeletons), I decided to group this cohort with the rest of subadults to facilitate the analysis by sex. These different manners of presenting data complicate the comparison between results from different authors. Nevertheless, as adolescents are usually a minority group in a skeletal sample (for example, they only represent 5.8% of the 736 individuals used in this study), the different way of presenting data probably do not have a great impact in the prevalence of malintent trauma in adults.

However, the analysis of the age cohorts presented here suggests that, at least in terms of violence, adolescents were treated the same way as adults. This interpretation has methodological bioarchaeological implications, as individuals 15 years and older should perhaps be grouped with adults. However, ethnohistoric accounts (e.g. Garcilaso 2005 [1609]; Guaman Poma 2008 [c.1615]; and Murúa 1946[1590]) indicate that the age for getting married during Inca times was 15-20 years for females and 25-30 years for males, suggesting that Inca females were considered adults from the late adolescence, while Inca males became "adults" during young adulthood. This apparent contradiction requires further investigation and the consideration of multiple lines of evidence and future bioarchaeological studies should be cognizant of this potential distinction. In addition, detailed studies of funerary patterns should be done in order to establish how adolescents were treated in death, at least in time periods with social differentiation based on age.

The criteria to establish if a lesion was intentional or not presented two challenges: 1) The poor preservation of some collections that made it difficult to see facial and perimortem trauma (which could, for instance, imply that the prevalence calculated for the Formative period is underestimating the real rate of cranial trauma); and 2) the comparison to collections studied by other researchers, as many of whom only described cranial trauma. As was seen in this study, cranial trauma alone is not enough to assess the full impact of violence in an individual or in a society. A good example of this is the low prevalence of cranial trauma found in non-ritual Moche contexts, which contrasted dramatically with other direct and indirect evidence of violence such as the ritual killings of prisoners and the rich iconography representing soldiers and (ritual or real) battle scenes. It seems that the same limitation of cranial trauma to represent the real levels of violence applies to the Late Lima period (MH 1). Thus, it is important to include many variables (osteological, archaeological, and ethnohistoric) in any study of violence in the past. The role of ritual violence as a set of different public activities that are used by the ruling elite to reinforce the group identity and power structure (Martin and Harrod 2015;

Martin et al. 2013) should be also considered in future studies of violence of the Peruvian central coast.

The use of the variable "lethality" (modified from Baraybar and Gasior 2006; and Lund 2009) was useful not only to make a differentiation between "lethal" and "non-lethal" trauma, but also to look for possible variations inside these two categories. For example, it helped to establish that the Early Colonial period was the time in which the most aggressive attacks occurred, not only indicated by the high prevalence of malintent trauma, but also by the number of extremely violent attacks that involved various hits to the head or body ("lethality V") (Figures 7.6 and 7.7). Likewise, it was seen that, despite the high peak of malintent trauma among males from the MH 3-4, the traumatic lesions were mostly described as low lethality ("lethality I").

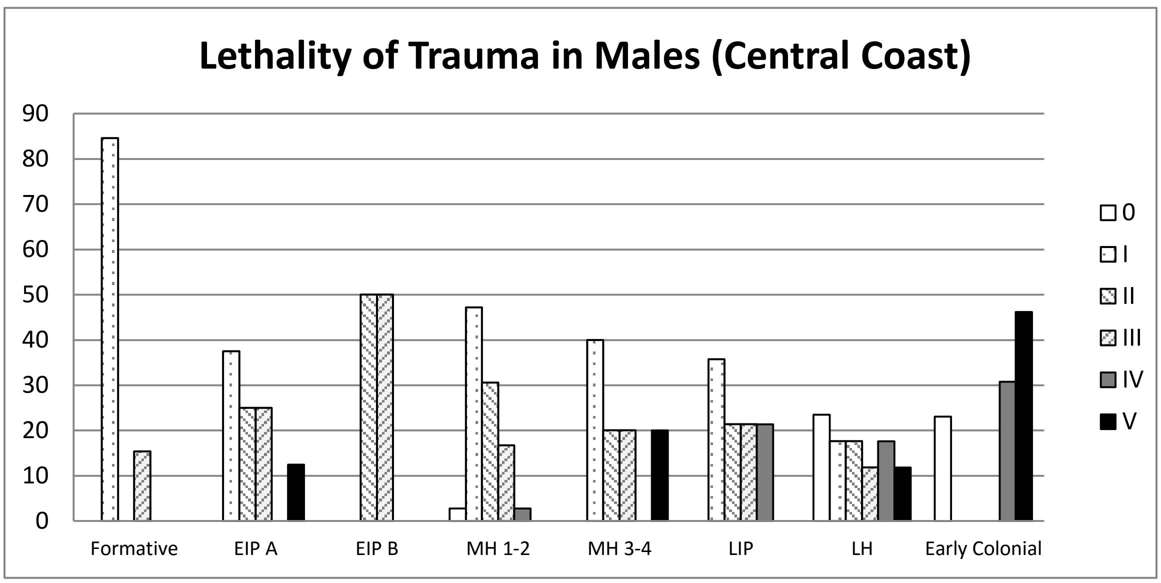

Figure 7.6: Prevalence of Trauma in Males by Lethality on the Central Coast

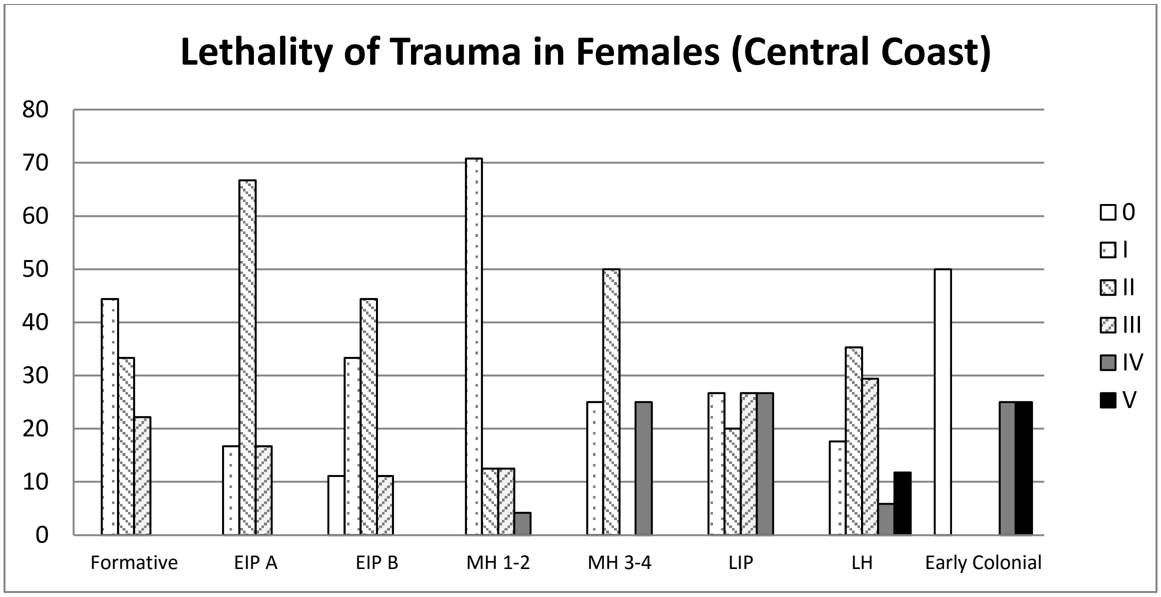

Figure 7.7: Prevalence of Trauma in Females by Lethality on the Central Coast

The MNEv was useful to asses if the lesions presented in an individual were likely produced in a single or in different violent events. In this way, it seems that only during the LIP is there enough evidence (judging for the different stages of healing of the lesions) to conclude that people were involved in violent events more than once in their lives. By using this variable (complemented with the low number of cranial fractures in the same individual) it was concluded that there is little skeletal evidence that ritual battles were performed in the pre-Hispanic central coast. This result is consistent with the suggestion that the dichotomy between “real war” and “ritual war” was created during the post-contact period (Hastorf 1993; Topic and Topic 1997, 2009).

The size of the sample was a limitation in this study, specifically in the two periods in which the number of adults (including both the samples analyzed here and the comparative samples) was less than 20 individuals: the EIP B (Cerro Culebra) and the MH 3-4 (Ancón). Although these two periods showed an apparent rise in the prevalence of malintent trauma, the calculation of odds ratios did not always reveal statistically significant differences when the results were compared to the previous or the next time periods. Thus, future bioarchaeological studies in the central coast should concentrate on expanding the samples from these periods. With the exception of Cerro Culebra and Copacabana, the fact that many of the samples used in this study were recovered in archaeological salvage excavations, probably did not produced a bias in the study, as the interventions covered extended areas of the sites.

The models that established the most likely manifestation of violence (e.g. battle, raiding, massacre, etc.) were not easy to apply. As stated in Chapter 2, these models are only an approximation of the most probable cause of the lesions, as some factors (e.g. attacks by different persons coming from different sides, or the movement of the victims as they try to escape from the attack) could produce lesional patterns that do not conform to the models. This was especially true in the cases of females. One problem arose when females exhibited most of the lesions in the anterior aspect of the skull (such as the Middle and Late Lima samples). Where these females active participants in the encounters, or where they passive victims of an attack from the front? There are ethnohistoric accounts of the active participation of women in the battles against the Spaniards in Ecuador and Bolivia (e.g. Dransart 1987 and Thomson 2007), although these were uncommon. Similarly, the women from the modern Andean highland community presented in this study, were ready to fight back if their partner was physically abusive. Of course this information should be used cautiously when examining a society so far in time and space such as the Lima culture. Also, the models alone do not answer questions such as who was the perpetrator of the episodes of violence. For example, the cases of warfare and massacre seen during the LIP could be explained as internal social conflicts among the Ychsma as the result of a social chaos produced by severe droughts, or could also been explained as the result of the use of military actions employed by the Inca Empire to conquer the Ychsma territory. Finer radiocarbon dating is needed to try to clarify the approximate dates of these events.

Another problem emerged when I tried to assess the osteological impact of domestic violence in the skeleton. The modern Andean forensic sample used in this study failed to provide a model to infer possible cases of domestic abuse in Andean contexts. However, it showed how difficult is to trace this kind of violence, even in a context in which domestic abuse was common. Thus, it seems that domestic abuse in the Andes, albeit extended, usually is not violent enough to leave lesions in the skeleton. It is possible that the same situation applies to pre-Hispanic populations.

In Chapter 2, I presented a brief discussion about the methodological approach of bioarchaeology and clinical/forensic medicine to the study of violence. As I stated in that chapter, both approaches share common points, such as the search for the identity of the victims and perpetrators, the nature of the injuries, and the context in which those injuries where produced. However, even though both clinical/forensic and bioarchaeological research aim to reconstruct the context of violence, the former is usually more focused on the reconstruction of the context of violence at an individual level, while bioarchaeology is generally focused on the broader social-cultural and political contexts, yet it is built upon individual-level data.

Because of their nature, each approach has its own strengths and limitations. For instance, while clinical/forensic studies can corroborate the information with official records or by interviews, bioarchaeology is usually restricted to the reconstruction of the most probable estimations and scenarios inferred from the study of the skeletons and the archaeological contexts. These limitations also apply to this study. For example, as it has been shown that even attacks with deadly weapons (e.g. guns or bows and arrows) do not always leave marks in the skeleton (see for example de la Grandmaison et al. 2001 and Milner 2005), it is very likely that the prevalences of malintent trauma presented in this study underestimate the real intensity of violence in the central coast.

Finally, both clinical/forensic and bioarchaeological studies could benefit by adopting strategies in the research of violence that incorporate elements from the other approach. Clinical/forensic studies could use a multidisciplinary perspective (including social science and humanities) to more exhaustively to expand their understanding of modern manifestations of violence. Bioarchaeology, on the other hand, is still in need of standardized protocols that can help in the comparison of results from clinical and other bioarchaeological studies (a limitation that I faced during this research), and from the inclusion of exhaustive differential diagnoses and models. I hope that this research could contribute to the methodological debate around the study of violence.

Chapter 8

8 Conclusion

As stated in the introduction of this dissertation, the study of the patterns of violence in past populations greatly informs our understanding of the political, economic, social and environmental forces that shaped ancient societies. The main purpose of this research was to test questions about the development of violence on the Peruvian central coast during the pre-Hispanic and Early Colonial times, with the aim of contributing to our knowledge of the Andean past. The null hypothesis: that "there are no differences in the prevalence and pattern of trauma over time", was clearly rejected. Violence, expressed by different patterns of trauma, was not the same through time on the Peruvian central coast or in the other Andean regions.

Two complementary questions were also addressed: 1) Was there a relation between sociopolitical changes, natural catastrophes and conflicts over resources and violence? and 2) How did violence affect specific segments of the population (males, females, subadults, and elite and non-elite persons)? In light of the evidence presented here, I proposed that the changes in the prevalence of malintent trauma were strongly correlated with specific socio-political and climatic events, such as the expansion of the Wari Empire and the Spanish conquest (due to the use of military coercion by the Empires as they faced resistance from the local population), and Mega El Niño events. Furthermore, I also proposed that males (especially low status individuals) would be most affected by the diverse manifestations of violence.

Another important objective of this research was to fill the gap of information about violence from the central coast (see Arkush and Tung 2013), not only by generating new data, but also gathering information – both published and unpublished - especially those with limited distribution among researchers. In this way, this study is the first effort to understand the evolution of violence on the central coast, as seen over a long time span (around 3000 years), and one of the few (e.g. Andrushko and Torres 2011; Klaus 2014;

Tomasto 2009; and Torres-Rouff and Costa 2006) that have accomplished this for a specific Andean region.

This study does not only contribute to the knowledge of non-ritual violence in the pre-Hispanic and Early Colonial Andes, it also provides some methodological insights (e.g. the use of the variables “lethality” and “minimum number of events”, and models for different types of physical violence) for the analysis of trauma that will inform future bioarchaeological investigations.

However, the main contribution of this study is its long temporal perspective, and its social complexity perspective that will enrich the anthropological debate around violence, providing a better understanding on how violence unfolds in different cultures and different situations within cultures.

8.1 The “History of Violence” of the Central Coast

Three major types of violence were identified in the period between the Formative and Early Colonial periods: intragroup male conflict resolutions, warfare (including traditional battles, raiding, killing of prisoners, trophy taking, and massacres), and possible domestic abuse (affecting females and children). Raiding seemed to have been more common in the pre-Wari era and rare afterwards. There is no strong evidence to support the presence of pre-Columbian ritual confrontations, which corresponds to suggestion that the dichotomy between “real war” and “ritual war” was created during the post-contact period (Hastorf 1993; Topic and Topic 1997, 2009).

Formative Period

Violence during this period was very low: the prevalence of malintent trauma did not exceed 10%. Violence was restricted to isolated cases of intragroup violence (male physical confrontations). It seems that the central coast was one of the less violent areas of the Andean region during this period. These results are consistent with the suggestions of different authors on the basis of other forms of evidence (e.g. Burger 1987, 1992, 2009; Burger and Salazar 2009a and b, 2012; Collier 1955; Narváez 2013; Patterson 1983 and Vega-Centeno 2010) that during the Formative period the central coast was occupied by non-complex societies without a strong social differentiation and that violence was not used to coerce people to build the monumental structures that were constructed at this time.

Early Intermediate Period A

Violence increased during the transition to the EIP. The prevalence of cranial trauma in males of the Lurín Valley was moderate or even high in some sites (20-40%) and was associated with episodes of warfare (including traditional battles) and intragroup violence (conflict resolution?). The prevalence of cranial trauma in females was lower than in males (12.8%) and was probably the result of raiding and female abduction, associated with warfare. Females were also possible victims of trophy taking and captive killing/capital punishment. The prevalence of cranial trauma in other Andean regions was similar, but not necessarily related to the same manifestations of violence. This rise in the prevalence of malintent trauma coincided with the appearance of clear signs of social stratification, defensive architecture, and weapons in different sites of the Rímac and Lurín Valleys.

Early Intermediate Period B

Based only on a small sample from Cerro Culebra, it seems that the levels of violence in the central coast during the EIP B was high in adults (50% - 7/14). Both sexes presented a similar pattern of non-lethal fractures concentrated in the anterior part of the skull, although males also presented lesions on the rear of the skull. These fractures were possibly inflicted during violent encounters, when the victims were facing their attackers. This period also marks the appearance of the first case of possible child abuse reported for the central coast.

The prevalence of non-lethal violence increased from the EIP A, and was also higher than in other EIP B sites of other Andean regions. Although war (ritual or real) was present during the EIP A and among the neighbouring Moche and Nazca, there is no strong evidence to support its presence among the Lima. It is possible that this increase in the levels of violence during the EIP B could have been related to the increment in the size of the population and a subsequent expansion during the end of the EIP to the Lurín Valley that was suggested by Earle (1972), MacNeish and colleagues (1975), and Patterson and Lanning (1964). This time coincided with a period of severe droughts between A.D. 570 and 610 (Middle and Late Lima periods) (Thompson et al. 1985).

Middle Horizon 1-2

The prevalence of cranial trauma among Late Lima males was moderate (25.4%) in males, low in females (16.1%), and very low in subadults (5.3%). At least in Huaca 20, low status individuals were more exposed to violence that higher status individuals.

Both males and females were involved mostly in non-lethal face-to–face confrontations. However, there is also evidence that some individuals (males and females) could have been victims of raiding. The presence of possible sacrificed captives and possibly of trophy heads also suggests that the Lima people were not only victims but also aggressors in warfare.

It seems that the combination of socio-political changes and natural disasters, and the expansion of a stronger state that occurred during the MH 1 did not produce a rise in the prevalence of malintent trauma among the Lima. However, other lines of evidence (e.g. more cases of perimortem cranial trauma, trophy heads, possibly sacrifice of warriors, and weapons as grave goods) suggest that warfare did increase (and became more complex and ritualized) during the MH 1 on the central coast, as a consequence of the direct or indirect influence of the Wari. Moreover, the comparison with other Andean regions indicated that, with the exception of the Wari of some areas of the south highlands (especially, Arequipa), violence was highest among the Late Lima during the MH 1-2. It is also possible that when the Wari consolidated in the central coast (MH 2) the levels of violence dropped.

Middle Horizon 3-4

Violence affected more than 50% (5/9) of the adults from the small sample of Ancón. Males faced both non-lethal and lethal events, possibly related to warfare, which occasionally affected females. It seems that the prevalence of cranial trauma in males was higher in the central coast than in other regions (e.g. the Wari heartland and northern

Chile). The MH 3-4 (or post-Wari collapse) period presented a rise in the prevalence of adult cranial trauma compared with the MH 1-2 (the time of the Wari expansion and consolidation). However, more studies are needed to confirm if this period of political crisis actually produced an escalation of violence (as happened in the south highlands and in northern Chile).

Late Intermediate Period

As happened in many central Andean regions, the Ychsma from the central coast experienced high levels of violence, in the form of battles, raiding, massacres, and possible domestic abuse. Lethal trauma to the head and thorax was present in approximately one half of the population older than 12 years from the site of Armatambo-22 de Octubre. With the exception of the south highlands and the Chancay site of Las Shicras, the prevalence of cranial trauma in the central coast was generally higher (especially in males) than in other regions. As was seen in other Andean regions (e.g. the south highlands and northern Chile), violence became more lethal and repetitive than during the MH 3-4. These results coincided with a time of socio-political crisis and severe droughts that affected most of the Andean region. It is possible that an increase in violence occurred during the latest part of the LIP, related to the expansion of the Inca Empire.

Late Horizon

Violence did not affect all of the Ychsma polities in the same way. Although during this period the prevalence of cranial trauma dropped, the opposite happened with lethal trauma. The highest prevalence of cranial trauma among the Ychsma polities was found in the Caringa and Lati *ayllus*/*curacazgos*, the two groups likely more related to military activities, as they controlled the access to the central highlands (a region with the highest evidence of malintent trauma in the Andean region).

The archaeological and bioarchaeological evidence suggests that in general terms, the central coast was peacefully annexed to the Inca Empire. With the exception of male warriors (and their possible female companions), violence during the Inca occupation of the central coast was less common and less lethal than during the LIP, suggesting that the strong and centralized organization of the Inca State brought a better situation to commoners with respect to their exposure to violence. However, the multiplication of sites with weapons, and the new weapons introduced in the area suggest that military coercion was employed when necessary, especially in the Ychsma periphery.

Early Colonial

The unusual number of males (especially from the adolescent and young adult cohorts) affected by lethal trauma to the head or thorax, indicates that the individuals interred in the superficial levels of the 57AS03 cemetery from Puruchuco-Huaquerones were killed in battle, probable during the Siege of Lima, as was already proposed by Murphy and colleagues (2010) and Lund (2009). It is not possible to tell from this unique sample if the levels of violence at other central coast sites were high during this period or not. The scarce evidence of lesions produced by European weapons suggests that cases like Puruchuco-57AS03 were exceptional. It is possible that, as Vega (1992) stated, many of the battles were between indigenous troops that stayed loyal to the Inca, and indigenous troops (using Andean weapons) that fought for the Spaniards. However, it is also possible that other gunshot wounds or lesions produced by other European weapons have been overlooked.

8.2 The Causes and Effects of Violence in the Peruvian Central Coast

The null hypothesis: that "there are no differences in the prevalence and pattern of trauma over time", was rejected. The expectations that the changes in the prevalence of malintent trauma were strongly correlated with specific socio-political and climatic events and that low status males were the most affected by violence were confirmed, although some of the findings varied from what was initially expected.

The emergence of social differentiation and a warrior elite (possibly starting during the Initial Period but consolidating during the EIP A) and the socio-political crisis produced after the fall of a previous social order (MH 3-4/LIP and possibly the EIP B and the Early Colonial period) were the socio-political changes that were related to periods in which violence increased. The expectation that the expansion of the Wari Empire would be accompanied by a rise in the prevalence of malintent trauma was not supported. The evidence suggested that during the presence of the Wari (MH 2) and the Inca (LH) Empires the levels of violence dropped. However, the relation between strongly centralized societies and lower levels of violence was not met in other Andean regions (e.g. the south coast and northern Chile during the MH and the north coast and the Cuzco region during the LH). These findings are consistent with the proposal that the Wari and Inca Empires employed diverse strategies during their expansion, in which the use of military force was not always necessary.

The hypothesis that Mega El Niño events would have triggered violent events was partially denied. Although severe droughts (possibly associated to Mega El Niño events) that affected the EIP B and the LIP are indeed associated with escalating prevalence of malintent trauma, the wetter periods (present during the MH 1 and also related to Mega El Niño events) were not always associated with higher levels of violence.

Not only was violence more common during the periods of severe droughts (when food and water were scarce), but it was also elevated in areas where coastal and highland populations would meet (and competed for the local resources). This was evident during the EIP A (with possible conflicts between coastal and middle valley communities), and during the LH when a higher prevalence of malintent trauma among military groups suggested that they were controlling the access to the middle valley.

The suggestion that violence affected males and females differently was also confirmed. As was expected, males (especially those identified as warriors) presented more cases of malintent trauma than females. The evolution of the prevalence of malintent trauma and the kind of violence that affected both sexes was not always the same. Warfare (most likely “real” than “ritual”), which appeared for the first time during the EIP A, seemed to have affected males and females differently during the EIP A, MH 3-4, LH, but not during the LIP and possibly not during the MH 1-2. The prevalence of lethal trauma was usually similar between both sexes, except in periods in which the presence of a military group was more evident: the EIP A, the LH, and the Early Colonial periods. The MH 3-4 was the exception to this pattern, although, again, the small size of the Ancón sample analyzed in this study did not allow the construction of a strong conclusion.

Until the time of the Wari (MH 1-2), the prevalence of malintent trauma in females (some of it, possibly produced by raiding) followed the variation in the prevalence of malintent trauma in males. However, after the Wari collapse, the prevalence of malintent/cranial trauma in females stayed between 15 and 25% for the rest of the sequence, and raiding became rare. After the collapse of the Wari Empire, females could have been incidental victims of warfare (especially those accompanying warriors).

The few cases identified as possible cases of domestic abuse in females do not necessarily mean that this practice was rare in the central coast, as my analysis of the modern forensic sample suggests. This forensic case demonstrated that even in contexts in which domestic abuse was frequent; their presence can be osteologically undetectable and that we are likely underestimating the amount of trauma that was actually expressed in ancient societies.

Another research question that was tested was if subadults experienced violence in a different way than adults. Generally, the prevalence of malintent trauma in subadults (including adolescents) was less than 10%. Individuals younger than 12 years of age were rarely affected by violence. Only one suspicious case of child abuse was detected in the EIP B sample. Adolescents were affected in a similar pattern as the adult cohorts (especially during periods of greatest violence: the LIP and the Early Colonial period). This suggests that in violent events, adolescents were treated as adults and that infants and children where usually spared. It is possible then, that our conceptualization of what is a “subadult” probably did not apply in precolonial times.

The final research question of this research (“low status individuals were more exposed to violence”) was also confirmed, at least during the MH 1, the LIP, and the Ychsma-Lati during the Inca occupation. The same situation was found in northern Chile (Middle Period) and in the central coast site of Puruchuco-Huaquerones (LH). It was not possible to reach any conclusions about status differences in other periods for the lack of samples that allow to make comparisons between low and middle/high status groups. The exception was the Early Contact sample, in which no difference in the exposition to lethal malintent trauma between low and middle status individuals was found, possibly due to the unique context of this sample.

To summarize, the reconstruction of the 3000-year history of violence on the central coast showed an intricate convergence of socio-political and certain climatic events that played together to trigger – or suppress - violent episodes in the area. The main factors that contributed to the escalation of violence in the area seem to be the emergence of social differentiation/a warrior elite and the socio-political crisis produced after the fall of a previous social order, combined with the need to fight for resources, either during severe droughts or to control the resources of the middle valley. Males (adults and adolescents), especially those dedicated to military activities or those from lower status strata were more exposed to violence than the rest of the population. However, in times when violence rose, females were equally affected. The comparison of the findings in the central coast with other Andean regions showed that not all societies reacted in the same way when faced with similar socio-political /environmental challenges. The inter-regional comparisons demonstrate that one should not generalize the results from one site or even from a single region to understand the socio-political processes of the entire Andean region.

8.3 Future Studies

Although the results of this investigation represent a contribution in the study of violence on the Andean region, further research is still required. One of the most evident shortcomings of this investigation is the small size of the EIP B (Early-Middle Lima) and the MH 3-4 (Terminal Wari) samples. Future efforts should be concentrated on the analysis of more individuals from these periods (e.g. from Playa Grande and Pachacamac). Ideally, it would be important to analyze a larger collection of central coast skeletons (with associated radiocarbon dates) that allows separation in finer chronological periods, thus making subtle changes easier to detect. For example, more individuals from the Final Formative are needed to observe if the so-called “post-Chavín crisis” was associated with violence, as the archaeological evidence in different regions suggest.

However, more archaeological studies that clarify the socio-political contexts of the different periods of the central coast are also necessary.

It would also be interesting to extend this research to collections from the middle valleys to confirm if violence was more common in this area than in the sites closer to the littoral. More sites should also be included to test additional research questions, such as whether violence was more prevalent in peripheral sites than in the main settlements (e.g. U-temples area vs. fishing communities during the Formative period). DNA and isotopic analysis would be also useful to try to identify the ethnic /geographical origin of the suspected captives and trophy heads.

Although the results of this doctoral research are specific to the Peruvian central coast, the general findings could be used in broader studies about violence. However, bioarchaeological research on violence still requires standardized methods and unification of criteria that facilitate cross-cultural comparisons. Most of the available data is limited to cranial fractures, underestimating the real prevalence of malintent trauma, as other osteological manifestations of violence (e.g. parry fractures, puncture or cuts wounds, etc.) and other variables explored in this study are left out. It is also necessary to include other kinds of violence such as ritual and structural violence for a better understanding of this phenomenon.

I hope that this research will make a contribution not only by adding an extra piece to the puzzle of the studies of violence in the Andean region, but also by providing some new criteria to be taken into consideration in future studies about violence.

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Appendices

Appendix I: Summary Data for La Capitana

Code	Sector	Age	Sex	Cohort	Social Group	Mal-intent	Acci-dental	Occupa-tional	Un-known	Vault	Face	Parry FX	Boxer's Fx	Teeth	Brief description	Lethality	MNEv
Ind 03	S IV CF 03	25-35	M	Young Male	Low Status	0	1	0	0	0	0	0	0	?	T12 (body, AM); R clavicle (sternal end, AM)	I	1
Ind 04	S I CF 07	1-3	?	Early Child	Low Status	?	?	?	?	0	?	0	?	?			0
Ind 07	S II CF 02	40-44	F	Middle Adult Female	Low Status	?	?	?	?	?	?	0	0	?			0
Ind 11	S II CF 06	9-15 m	?	Early Child	Low Status	?	?	?	?	0	?	0	?	?			0
Ind 13	S II CF 08	adult	M?	Middle Adult Male	Low Status	?	?	?	?	?	?	0	0	?			0
Ind 14	S II CF 09	adult	M	Adult Male	Low Status	0	?	?	?	0	0	0	0	?			0
Ind 18	S II CF 13	35-39	F	Middle Adult Female	Low Status	?	?	0	?	0	0	?	0	?			0
Ind 27	S II CF 21	adult	F?	Adult Female	Low Status	?	?	?	?	0	?	0	?	?			0
Ind 31	S III CF 07	30-40	M	Middle Adult Male	Low Status	0	0	0	?	0	0	0	0	?			0
Ind 35	S III CF 11	3-9 m	?	Infant	Low Status	?	?	0	?	0	?	0	0	?			0

Ind 36	S III CF 13	1.5-2.5	?	Early Child	Low Status	?	?	?	?	0	0	?	?	?			0
Ind 37	S III CF 12	25-35	M	Young Male	Low Status	0	?	?	?	0	0	0	?	?			0
Ind 38	S III CF 14-2	3-5	?	Early Child	Low Status	?	?	?	?	0	0	?	?	?			0
Ind 39	S III CF 14-1	25-29	M?	Young Male	Low Status	0	?	0	?	0	0	0	0	?			0
Ind 40	S III CF 15	25-35	M	Young Male	Low Status	1	1	0	?	0	0	0	1	?	R 2nd-5th metacarpals (shafts, AM); R radius (M1/3, AM);L fibula(P1/3, AM)	I	1
Ind 41	S III CF 16	6-8	?	Late Child	Low Status	0	?	0	?	0	0	0	0	?			0
Ind 42	S III CF 17	45-49	M	Middle Adult Male	Low Status	0	1	?	?	0	0	0	0	?	L4 (body, AM)	I	1
Ind 43	S III CF 18	25-45	M	Middle Adult Male	Low Status	0	0	0	?	0	0	0	0	?			0
Ind 45	S III CF 19	50+	F?	Old Female	Low Status	0	?	?	?	0	0	0	?	?			0
Ind 46	S III CF 21	20-40	M	Young Male	Low Status	0	0	0	?	0	0	0	0	?			0
Ind 47	S III CF 22	40-44	M	Middle Adult Male	Low Status	0	0	1	?	0	0	0	?	?	L 3rd metatarsal (shaft, AM)	I	1
Ind 49	S III CF 24	30-34	M	Young Male	Low Status	1	?	1	?	1	0	0	0	?	Frontal (R, AM); L 3rd metatarsal (shaft, AM)	III	1

Ind 51	S IV CF 01	2.5-3.5	?	Early Child	Low Status	0	?	0	0	0	0	0	0	?			0
Ind 52	S IV CF 04	9.5-14.5	?	Late Child	Low Status	?	?	0	?	0	0	?	?	?			0
Ind 53	S IV CF 05	11-13	?	Late Child	Low Status	0	0	0	?	0	0	0	0	?			0
Ind 54	S IV CF 06	25-29	F	Young Female	Low Status	0	1	0	?	0	0	0	0	?	L fibula (M1/3, AM)	I	1
Ind 55	S IV CF 07	50+	F	Old Female	Low Status	?	1	0	?	0	?	0	0	?	T10-T12 (bodies, AM)	I	1
Ind 56	S IV CF 09	30-34	F?	Young Female	Low Status	0	?	0	?	0	0	0	0	?			0
Ind 57	S IV CF 08	adult	F?	Adult Female	Low Status	?	0	0	?	0	?	0	0	?			0
Ind 58	S IV CF 10	11-13	?	Late Child	Low Status	0	?	0	?	0	0	0	0	?			0
Ind 59	S IV CF 11	adult	M	Adult Male	Low Status	0	?	0	?	0	0	0	?	?			0
Ind 60	Sub. Zavala	6-8	?	Late Child	unknown	0	?	?	?	0	0	0	?	?			0
Ind 61	Sub. Zavala	4-6	?	Early Child	unknown	?	?	?	?	0	?	0	?	?			0
Ind 63	S IV CF 12	0-1	?	Infant	unknown	0	?	?	0	0	0	0	0	?			0

Appendix II: Summary Data for Asia and León Dormido

Code	Sector	Age	Sex	Cohort	Social Group	Mal-intent	Acci-dental	Occupa-tional	Un-known	Vault	Face	Parry FX	Boxer's Fx	Teeth	Brief description	Lethality	MNEv
T1S1R7	PERM Asia	18-23	F?	Young Female	Low Status	?	?	?	?	?	0	0	0	0	Possibly on R rib (body, AM)		0
T1S1R12	PERM Asia	35-45	F	Middle Adult Female	Low Status	0	1	0	1	0	0	0	0	?	Lumbar vertebra (body, AM); L rib (body, AM)	II	1
T1S1R20	PERM Asia	4-6	?	Early Child	Low Status	?	?	0	?	0	?	0	?	0			0
T1S1R21	PERM Asia	2-4	?	Early Child	Low Status	?	?	?	?	0	?	0	?	0			0
T1S2R2	PERM Asia	16-19	F	Young Female	Low Status	?	?	?	0	?	0	?	0	0			0
T1S2R10	PERM Asia	20-35	F	Young Female	Low Status	0	0	0	?	0	0	0	0	0			0
T2S1R8	PERM Asia	20-30	F	Young Female	Low Status	?	?	?	?	?	?	0	0	?			0
T2S2R5	PERM Asia	30-45	M?	Middle Adult Male	Low Status	?	?	?	?	0	0	?	?	?			0
T2S4R3	PERM Asia	12-16	?	Adolescent	Low Status	?	?	0	?	?	?	0	?	0			0
T2S4R4	PERM Asia	25-40	F	Young Female	Low Status	?	?	?	?	?	?	?	0	0			0
T2S4R9	PERM	25-35	M?	Young	Low Status	?	?	0	?	?	?	?	?	?			0

	Asia			Male													
T2S4R10	PERM Asia	17-25	F?	Young Female	Low Status	0	?	0	?	0	0	0	0	?			0
T2S4R11	PERM Asia	35-45	M	Middle Adult Male	Low Status	0	?	0	?	0	0	0	0	?			0
T2S4R12	PERM Asia	20-35	F?	Young Female	Low Status	0	1	?	?	0	0	0	0	?	L humerus (PE, AM, humerus varus deformity)	I	1
T2S4R16	PERM Asia	1.5-2.5	?	Early Child	Low Status	?	?	?	?	?	?	?	?	?			0
ABO 01	Asia Baja	3-5	?	Early Child	Low Status	0	?	?	?	0	0	0	?	?			0
ABO 02	Asia Baja	30-45	F	Middle Adult Female	Low Status	?	?	1	?	0	?	?	?	?	L5 (spondylolysis, AM)	I	1
ABO 03	Asia Baja	12-16	?	Adolescent	Low Status	0	?	0	?	0	0	0	0	0			0
ABO 04	Asia Baja	1.5-2.5	?	Early Child	Low Status	?	?	?	?	0	?	?	?	?			0
ABO 05	Asia Baja	35+	M?	Middle Adult Male	Low Status	0	1	0	?	0	0	0	?	?	1st PP of the R foot (PE, AM)	I	1
ABO 07	Asia Baja	3-4	?	Early Child	Low Status	?	?	?	0	0	?	0	?	0			0
ABO 09	Asia Baja	35-50	F	Middle Adult Female	Low Status	0	?	0	1	0	0	0	0	0	L rib (body, AM)	II	1
ABO 10	Asia Baja	25-50	M?	Middle Adult	Low Status	0	1	?	?	0	0	0	0	0	Thoracic vertebra (body, AM)	I	1

				Male													
ABO 11-1	Asia Baja	3-4	?	Early Child	Low Status	0	?	0	0	0	0	0	0	0			0
ABO 13	Asia Baja	3-4	?	Early Child	Low Status	0	?	?	?	0	0	0	0	?			0
ABO 14	Asia Baja	1.5-2.5	?	Early Child	Low Status	?	?	?	?	?	?	0	0	0			0
ABO 15	Asia Baja	4-5	?	Early Child	Middle Status	?	?	?	?	?	?	0	0	?			0
ABO 18	Asia Baja	1-2	?	Infant	Low Status	?	?	?	?	0	?	?	?	0			0
ABO 19	Asia Baja	peri-natal	?	Infant	Low Status	?	?	?	?	?	?	0	0	0			0
ABE 01	Asia Baja	20-35	F	Young Female	Low Status	0	?	?	1	0	0	0	0	?	R 10th rib (angle, AM)	II	1
ABE 02	Asia Baja	25-35	M	Young Male	Low Status	0	0	0	?	0	0	0	0	?			0
LD3 02	León Dormido 3	25-30	M	Young Male	Low Status	0	1	0	0	0	0	0	0	?	T7 (NA, AM)	I	1
LD3 03	León Dormido 3	35-50	F	Middle Adult Female	Low Status	0	1	0	1	0	0	0	0	0	L pubis (AM); S1-S2 (NA-body, AM); T12 (body, AM); 5th PP of the L foot (DE, AM); R 3rd rib (S1/3, AM)	III	2
LD3 05	León Dormido 3	35-45	M	Middle Adult Male	Low Status	0	1	0	0	0	0	0	0	?	1st PP-DP of the R foot (IP joint, AM); two foot MP (DE, AM)	I	1

LD3 09	León Dormido 3	45-55	F?	Middle Adult Female	Low Status	?	?	?	1	?	?	0	0	0	L 8th-11th ribs (angles, AM)	III	1
LD3 10	León Dormido 3	25-35	M?	Young Male	Low Status (fisherman?)	0	?	0	?	0	0	0	0	?			0
LD3 11	León Dormido 3	25-35	M	Young Male	Low Status	?	1	0	1	?	?	0	0	?	T11-L1 (bodies, AM); R radius and ulna (Colles' Fx, AM); L 3rd metacarpal (shaft, AM); 4th? DP of hand (PE, AM); 5th PP of the R foot (shaft, AM); L 2nd-6th? ribs (SE, AM); R 3rd rib (body and SE); two R ribs (SE, AM); possibly on T5 (body, AM) and 4th? PP of the R? foot (DE, AM)	III	1
LD17 01	León Dormido 17	20-30	M	Young Male	Low Status	0	?	1	?	0	0	0	?	0	L5 (spondylolysis, AM)	I	1
LD17 02	León Dormido 17	16-21	F	Young Female	Low Status	0	0	0	?	0	0	0	0	0			0
LD17 03	León Dormido 17	0.5-1	?	Infant	Low Status	?	?	0	?	?	?	?	0	0			0
LD17 05	León Dormido 17	0-0.5	?	Infant	Low Status	?	?	0	0	?	?	0	0	?			0
LD17 06	León Dormido 17	30-40	M	Middle Adult Male	Low Status	0	1	0	?	0	0	0	0	0	R 1st metacarpal (DE, AM); 5th PP of both feet (DE, AM)	I	1

LD17 07	León Dormido 17	25-35	M	Young Male	Low Status (fisherman)	0	1	0	0	0	0	0	0	0	Both lunates (AM); 5th PP of the R foot (DE, AM); possibly on sternum (body, PM)		I	1
LD17 08	León Dormido 17	peri-natal	?	Infant	Low Status	?	?	?	?	?	?	?	0	?				0

Appendix III: Summary Data for Tablada de Lurín

Code	Sector	Age	Sex	Cohort	Social Group	Mal-intent	Acci-dental	Occupa-tional	Un-known	Vault	Face	Parry FX	Boxer's Fx	Teeth	Brief description	Lethality	MNEv
CF 21	SE	3-4	?	Early Child	Low Status	0	?	?	?	0	0	0	?	?			0
CF 22	SE	3-9 m	?	Infant	High Status	?	?	?	?	0	?	0	0	?			0
CF 28	SE	25-35	F	Young Female	Low Status	0	0	0	?	0	0	0	0	?			0
CF 32	SE	4-5	?	Early Child	Middle Status (musician)	?	?	0	?	0	?	?	?	?			0
CF 41	SE	20-30	M	Young Male	Low Status	0	1	?	?	0	0	0	0	?	4th PP of the R hand (shaft, AM); 2nd PP of the R foot (PE, AM)	I	1
CF 58-I	SE	peri-natal	?	Infant	Low Status	0	0	0	?	0	0	0	0	0			0
CF 60	SE	30-45	M	Middle Adult Male	Middle Status (potter?)	0	1	0	?	0	0	0	0	?	R tibia (D1/3, AM)	I	1
CF 66	SE	0.5-1	?	Infant	Middle Status	?	0	0	0	?	0	0	0	?			0
CF 67	SE	30-50	M	Middle Adult Male	High Status (musician)	0	0	0	1	0	0	0	0	?	R 12th rib (body, AM)	II	1

CF 70	SE	15-16	F	Adolescent	Low Status (sacrifice or punishment)	1	?	0	1	1	1	?	?	1	Forearms (PM mutilation); R parietal (post, 34 x 22 mm, BFT, PM); frontal and facial bones (BFT, PM); teeth (22-24, & 32, PM); R 7-8th ribs (bodies, AM); and possible PM FX of R 1st-3rd and 5th-7th ribs; L 4th-8th and 10th ribs (bodies), and L 7th rib (angle)	V	2
CF 87-I	SE	35-45	F	Middle Adult Female	Middle Status	0	?	?	?	0	0	0	0	?			0
CF 87-II	SE	6-7	?	Late Child	Middle Status	0	?	?	?	0	0	0	?	0			0
CF 95	SE	35-45	F	Middle Adult Female	Middle Status	0	?	0	1	0	0	0	0	0	L 12th rib (body, AM); possibly on R 6th-8th ribs (S1/3, AM)	II	1
CF 126	SE	3-6 m	?	Infant	Low Status	?	0	0	?	0	?	0	?	?			0
CF 137	SE	7-9	?	Late Child	Middle Status	0	?	?	?	0	0	0	?	?			0
CF 140	SE	peri-natal	?	Infant	Low Status	0	?	0	0	0	0	0	0	0			0
CF 150-II	SE	16-17	M	Adolescent	High Status (soldier, musician)	0	1	0	?	0	0	0	0	?	5th PP of the L foot (DE, AM)	I	1
CF 151	SE	35-50	F	Middle Adult Female	Low Status (potter?)	?	?	?	?	0	?	0	?	?			0

CF 158	SE	peri-natal	?	Infant	Low Status	?	?	?	?	?	0	0	?	0			0
CF 160	SE	30-50	F	Middle Adult Female	Low Status	1	0	?	?	1	0	0	0	?	L parietal (post, 8.1 x 7.8 mm and 7.7 x 5 mm, AM)	II	1
CF 166-II	SE	0-0.5	?	Infant	Low Status	?	0	0	0	0	?	0	0	0			0
CF 169	SE	3-9 m	?	Infant	Low Status	?	?	?	?	?	?	?	?	?			0
CF 183-I	SE	peri-natal	?	Infant	Low Status	?	?	?	0	0	0	?	?	0			0
CF 186	SE	peri-natal	?	Infant	Low Status	?	0	?	?	0	?	0	0	0			0
CF 191-I	SE	20-30	M	Young Male	Retainer (soldier)	1	1	0	1	1	0	0	?	?	L parietal (lateral, 7.5 x 7.5 mm and 5 x 5 mm, AM); R parietal (post, 14.7 x 14.7 mm, AM); 5th PP of the L foot (DE, AM); 1st DP of the L foot (PE, AM); L 7th rib (angle, AM); R 6th rib (body, AM)	III	1
CF 198	SE	35-45	M	Middle Adult Male	Low Status (weaver)	1	?	?	1	0	1	0	0	?	Nasals (AM); L and R 7th ribs (bodies, AM)	II	2
CF 217	SE	12-15	?	Adolescent	Low Status	?	1	?	1	0	?	0	0	?	5th PP and MP of the R foot (PIP, AM); L 2nd rib (body, AM)	II	1
CF 234	SE	25-35	F	Young Female	Low Status	0	1	0	?	0	0	0	?	?	5th PP of the L foot (DE, AM); possibly on L 12th rib (AM)	I	1

CF 236	SE	30-45	M	Middle Adult Male	Middle Status (musician)	1	?	?	?	0	1	0	0	?	Mandible (R ascending ramus, AM)	I	1
CF 259-IV	SE	40-60	F	Old Female	Middle Status (weaver)	?	?	0	1	0	?	0	0	?	R rib (body, AM)	II	1
CF 273	SE	2-4	?	Early Child	Low Status	0	?	0	?	0	0	0	?	?			0
CF 274	SE	0.5-1	?	Infant	Low Status	?	?	?	?	?	?	?	?	?			0
CF 281	SE	0-0.5	?	Infant	Low Status	?	?	?	?	0	?	0	?	0			0
CF 282	SE	35-45	F	Middle Adult Female	Middle Status	1	1	0	1	1	0	?	0	?	L parietal (lateral-post, 15.2 x 8.4 mm, AM); 2nd PP of the L hand (shaft, AM); T12 (body, AM); L 4th? rib (SE, AM); L 12th rib (neck, AM); R rib (SE, AM); possibly on one L rib (S1/3, AM) and one R rib (body, AM)	III	1
CF 284-I	SE	3-5	?	Early Child	Low Status	0	?	?	?	0	0	0	?	?			0
CF 284-II	SE	14-16	?	Adolescent	Low Status	0	?	?	?	0	0	0	?	?			0
CF 286-I	SE	peri-natal	?	Infant	Low Status	0	?	0	0	0	0	0	0	0			0

CF 298	SE	45+	M	Old Male	Middle Status (soldier or hunter)	1	1	0	?	1	0	0	?	?	R parietal (lateral, 37.8 x 24.5 mm, 23.8 x 25 mm, 28.7 x 20.1 mm, BFT, PM); L radius (Colles' Fx, AM); 5th MP of the R foot (PE, AM); possible projectile wound on T12 (body and NA, PM)	V	2
CF 302-I	SE	25-35	M	Young Male	Low Status (weaver?)	1	1	0	1	0	1	0	0	?	Nasals (AM); 1st, 5th and unidentified DP of the L hand (DE, AM); L 9th-10th ribs (bodies, AM); R 3rd-4th ribs (SE, AM)	III	1
CF 303	SE	40-50	F	Middle Adult Female	Middle Status (potter)	0	?	?	?	0	0	0	?	?			0
CF 309	SE	peri-natal	?	Infant	Low Status	?	?	?	?	0	?	0	0	0			0
CF 320	SE	peri-natal	?	Infant	Low Status	?	?	?	?	?	0	0	?	0			0
CF 341	SE	0.5-1	?	Infant	Low Status	?	?	0	?	0	?	0	0	0			0
CF 348-II	SE	25-35	F	Young Female	Middle Status (potter)	0	1	1	1	0	0	0	0	?	R radius and ulna (Colles' Fx, AM); L5 (spondylolysis, AM); R 2nd rib (S1/3, AM); L 3rd? rib (SE, AM)	II	2
CF 372	SE	peri-natal	?	Infant	Low Status	?	?	?	?	?	0	0	?	0			0
CF 374-	SE	3-5	?	Early Child	Low Status	0	0	0	0	0	0	0	0	?			0

II																	
CF 379	SE	peri-natal	?	Infant	Low Status	?	?	?	?	?	?	0	?	0			0
CF 389	SE	peri-natal	?	Infant	Low Status	?	?	?	?	?	?	0	?	?			0
CF 390	SE	3-5	?	Early Child	Low Status	?	?	?	?	?	0	0	0	?			0
CF 408	SE	peri-natal	?	Infant	Low Status	0	0	0	?	0	0	0	0	0			0
CF 416	SE	0.5-1	?	Infant	High Status	0	1	0	0	0	0	0	0	?	L clavicle (acromial end, AM)	I	1
CF 521-II	SE	3-9 m	?	Infant	Middle Status (associated with male musician/ soldier-hunter and female potter	0	?	0	0	0	0	0	0	0			0
CF 562	SE	3-9 m	?	Infant	Low Status	?	?	?	?	?	?	0	?	0			0

Appendix IV: Summary Data for Cerro Culebra

Code	Sector	Age	Sex	Cohort	Social Group	Mal-intent	Acci-dental	Occupa-tional	Un-known	Vault	Face	Parry FX	Boxer's Fx	Teeth	Brief description	Lethality	MNEv
E 02	QII	1-2	M	Early Child	Middle Status	0	?	?	0	0	0	0	?	0			0
E 03	QII	5-7	?	Late Child	Low Status	0	?	0	0	0	0	0	0	0			0
E 04	QII	2-4	?	Early Child	Low Status (weaver?)	0	?	?	0	0	0	0	0	0			0
E 05	QII	1.5-3.5	?	Early Child	Low Status (associated with weaver?)	0	?	0	0	0	0	0	0	0			0
E 06	QII	peri-natal	?	Infant	Low Status (associated with weaver?)	0	?	0	0	0	0	0	0	0			0
E 07	QII	2-3	?	Early Child	Low Status	0	?	0	0	0	0	0	0	0			0
E 08	QII	30-45	F	Middle Adult Female	Low Status	0	1	0	1	0	0	0	0	?	1st PP of the hand (PE, AM); 1st PP of the R foot (DE, AM); 2nd MP of the R foot (PE, AM); R 4th? rib (SE, AM); L? 3rd or 4th rib (S1/3, AM); possibly in L5 (body, AM)	II	1
E 09	QII	15-24	F	Young Female	Low Status (weaver)	0	0	0	0	0	0	0	0	0			0
E 10	QII	3-5	?	Early	Low Status	0	?	?	0	0	0	0	?	0			0

				Child													
E 11	QII	40-60	F	Old Female	Low Status (weaver)	1	0	0	1	0	0	1	0	0	L ulna (D1/3, AM); R 3rd rib (SE, AM); L 12th rib (neck, AM)	II	1
E 11 (A4)	QII	40-50	F	Middle Adult Female	Low Status	1	1	?	1	1	0	0	0	?	L parietal (sup, 9.5 x 6.5 mm, AM); 5th PP of the L foot (DE, AM); R 4th, 5th or 6th rib (S1/3, AM)	II	2
E 12	QII	0.5-1	?	Infant	Middle Status	1	?	?	0	1	0	0	0	0	R parietal (post-sup, 32.5 x 1.2 mm, AM)	III	1
E 13	QII	3-5	?	Early Child	Low Status	0	?	?	0	0	0	0	0	0			0
E 14 or E 11(A3)	QII	25-35	F	Young Female	Low Status (associated with weaver)	0	1	0	0	0	0	0	0	0	L1 (body, AM)	I	1
E 15	QII	peri-natal	?	Infant	Low Status	0	?	?	0	0	0	0	0	0			0
E 16	QII	1-2	?	Early Child	Low Status	?	?	?	0	0	?	0	?	?			0
E 17	QII	peri-natal	?	Infant	Low Status	?	?	?	?	?	?	0	?	0			0
E 18	QII	4-5	?	Early Child	Low Status	0	?	?	0	0	0	0	?	0			0
E 19	QII	1-2	?	Early Child	Low Status	0	?	0	0	0	0	0	0	0			0
E 20	QII	3-4	?	Early Child	Low Status	0	?	0	0	0	0	0	?	0			0

E 21	QII	4-6	?	Early Child	Low Status (weaver)	0	?	0	0	0	0	0	0	0			0
E 22	QII	40-60	F	Old Female	Low Status	1	1	?	0	1	?	0	0	?	R parietal (post-sup, 10.54 x 9.10 mm, AM); coccyx (DE, AM)	III	1
E 24	QII	3-6 m	?	Infant	Low Status	?	?	?	?	0	0	?	?	0			0
E 27	QII	17-20	M	Young Male	Low Status	0	?	?	0	0	0	0	?	0			0
E 28	QII	2-3	F	Early Child	Low Status	?	?	?	0	0	0	?	?	0			0
E 29	QII	30-40	M	Middle Adult Male	Low Status	1	1	?	0	1	1	0	0	1?	Frontal (R, 24 x 8 mm, AM); frontal (L, 12.3 x 9.2mm, AM); R parietal (ant, 7.1 x 5.7 mm, AM); L nasal (AM); 2nd PP of the hand (D1/3, AM); possibly in teeth (11, 21, 22, 23 & 44; AM) and L maxilla (frontal process, AM)	III	1
E 30	QII	40-60	F	Old Female	Low Status	0	?	?	0	0	0	0	0	?			0
E 31	QII	6-8	F?	Late Child	Low Status	0	?	?	0	0	0	0	0	0			0
E 34	QII	5-6	?	Late Child	Low Status	0	?	0	0	0	0	0	0	?			0
E 35	QII	0.5-1	?	Infant	Low Status	0	?	?	0	0	0	0	?	0			0
E 36	QII	0.5-1.5	?	Infant	Low Status	0	?	0	0	0	0	0	0	0			0

E 37	QII	30-45	F	Middle Adult Female	Low Status	0	1	?	0	0	0	0	?	?	R radius (Colles' Fx, AM); 1st PP of the R hand (PE, AM)	I	1
E 39	QII	0.5-1	?	Infant	Low Status	?	?	?	0	?	0	0	?	0			0
E 40	QII	0.5-1	?	Infant	Low Status	0	?	0	0	0	0	0	0	?			0
E 40A	QII	40-50	F	Middle Adult Female	Low Status	1	0	0	0	0	1	0	0	0	Mandible (L condyle, AM)	I	1
E 41	QII	2-3	?	Early Child	unknown	0	?	0	0	0	0	0	0	0			0
E 42	QII	25-35	M	Young Male	Low Status	0	?	?	0	0	0	0	0	0			0
E 42A	QII	peri-natal	?	Infant	Low Status	?	?	?	0	0	?	?	?	0			0
E T1	QII	25-35	M	Young Male	unknown	1	?	?	0	1	0	0	?	0	R parietal (post, 5 x 2 mm, AM)	II	1
E T4	QII	1.5-2.5	?	Early Child	unknown	?	?	?	0	0	0	?	?	0			0
E T5	QII	peri-natal	?	Infant	unknown	0	?	0	0	0	0	0	0	0			0
E 01	QIII	1-2	?	Early Child	unknown	?	?	?	0	?	0	0	?	0			0
E 02	QIII	13-16	F?	Adolescent	unknown	?	?	0	0	?	0	0	0	?			0
S/R	QIII	2-4	?	Early Child	unknown	?	?	?	?	0	0	?	?	?			0
S/R	QIII	25-35	F	Young	unknown	1	?	?	?	0	1	?	?	?	Mandible (R	II	1

				Female											angle, AM)		

X-rays observation

Appendix V: Summary Data for Huaca 20

Code	Sector	Age	Sex	Cohort	Social Group	Mal-intent	Acci-dental	Occupa-tional	Un-known	Vault	Face	Parry FX	Boxer's Fx	Teeth	Brief description	Lethality	MNEv
CF 06A		2-4	?	Early Child	Low Status	?	?	0	0	?	0	0	?	?			0
CF 06B		35-45	F	Middle Adult Female	Low Status	0	0	0	?	0	0	0	0	0			0
CF 08		5-8	?	Late Child	Low Status	0	0	0	?	0	0	0	0	?			0
CF 09A		1.5-2.5	?	Early Child	unknown	?	?	?	?	?	?	?	?	?			0
CF 09C		peri-natal	?	Infant	unknown	0	?	0	0	0	0	0	?	0			0
CF 10		16-19	?	Adolescent	Low Status	0	0	0	?	0	0	0	0	0			0
CF 11		25-35	F	Young Female	Low Status (weaver)	0	0	0	?	0	0	0	0	0			0
CF 15		25-40	F	Young Female	Low Status	0	?	0	?	0	0	0	?	0			0
CF 16		35-45	M	Middle Adult Male	High Status	1	1	0	?	0	1	0	0	?	Frontal (L, AM); 5th PP of the L foot (shaft, AM)	II	1
CF 19		3-6 m	?	Infant	Low Status	0	?	0	?	0	0	0	0	0			0

CF 20		35-45	F	Middle Adult Female	High Status (weaver, musician, grinder)	0	?	1	?	0	0	0	0	?	L5 (spondylolysis, AM)	I	1
CF 21A		35-45	F	Middle Adult Female	Low Status (weaver)	?	1	0	?	0	?	0	?	0	T7 & L3 (bodies, AM)	I	1
CF 22A		20-22	F	Young Female	Low Status (weaver)	?	?	?	1	0	0	?	0	0	Rib (body, AM)	II	1
CF 23		7-11	?	Late Child	Low Status	0	?	?	?	0	0	0	0	0			0
CF 24		35-45	M	Middle Adult Male	Low Status	1	1	0	1	1	0	0	0	0	R parietal (post, 15 x 10 mm, AM); L parietal (sup, 40 x 25 mm, AM); hamate and navicular of the R hand (AM); R 3rd metacarpal (PE, AM); L 5th rib (SE, AM); L 9th-10th ribs (angles, AM); possibly in R 7th rib (S1/3, PM).	III	2
CF 25		peri-natal	?	Infant	Low Status	?	?	?	?	0	?	0	?	0			0
CF 26		peri-natal	?	Infant	Low Status	?	1	?	?	0	?	0	?	0	R clavicle (sternal end, AM)	I	1
CF 27		2-4	?	Early Child	Low Status	0	?	?	?	0	0	0	?	?			0
CF 28		3-9 m	?	Infant	Low Status	?	?	?	?	0	?	0	?	0			0

CF 29		17-19	M	Young Male	Low Status	0	0	0	0	0	0	0	0	0			0
CF 30		35-45	F	Middle Adult Female	High Status (weaver)	0	0	0	?	0	0	0	0	0			0
CF 31		1-2.5	?	Early Child	Low Status	0	?	0	0	0	0	0	?	0			0
CF 33		35-45	F?	Middle Adult Female	Low Status	1	1	1	1	1	?	0	0	?	Frontal (R, 10.5 x 5.5 mm, AM); 2nd MP of the L foot (PE, AM); L4 (spondylolysis, AM); R 3rd?-5th? rib (SE, AM)	III	1
CF 34		2-4	?	Early Child	Low Status	0	?	0	?	0	0	0	0	0			
T 102		30-50	F	Middle Adult Female	High Status	1	1	0	?	1	0	0	0	?	Frontal (R, 10 x 7.5 mm, AM); T7-10 & L4?-L5? (bodies, AM); 1st PP of the R foot (PE, AM)	III	1
T 103		20-30	M	Young Male	Low Status	0	0	0	?	0	0	0	0	0			0
T 105-1		peri-natal	?	Infant	Low Status	?	?	?	?	?	?	?	?	0			0
T 105-2		2-3	?	Early Child	Low Status	?	?	?	?	0	0	?	?	?			0
T 106		20-23	M?	Young Male	Low Status	?	?	0	?	0	?	0	?	0			0

T 107		21-24	F	Young Female	Low Status (weaver)	?	1	0	?	?	0	0	0	0	L humerus (M1/3, AM); T12 (body, AM); L 3rd metacarpal (PE, AM); 5th PP of the R foot (PE, AM)	II	1
T 109		1-2	?	Early Child	Low Status	?	?	0	0	?	0	0	0	0			0
T 110		20-23	M	Young Male	Low Status	?	0	0	?	?	?	0	0	?			0
T 111		peri-natal	?	Infant	Low Status	?	?	?	?	?	?	?	0	?			0
T 112		3-4	?	Early Child	High Status	?	?	?	?	?	?	0	?	0			0
T 113		1-1.5	?	Early Child	Low Status	?	?	?	0	0	0	?	?	?			0
T 114		peri-natal	?	Infant	Low Status	?	?	?	?	?	?	?	?	0			0
T 116		3-4	?	Early Child	Low Status	?	?	?	?	?	0	0	0	0			0
T 117		peri-natal	?	Infant	Low Status	?	?	?	0	?	?	0	0	0			0
T 118		0.5-1	?	Infant	Low Status	?	?	0	?	?	?	0	?	0			0
T 121		3-5	?	Early Child	Low Status	?	?	?	?	?	?	0	?	0			0
T 122		1-1.5	?	Early Child	Low Status	?	?	?	?	0	?	?	?	?			0
T 123		1-2	?	Early Child	Low Status	0	?	?	?	0	0	0	0	0			0

T 124		peri-natal	?	Infant	Low Status	0	?	0	0	0	0	0	?	0			0
T 125		1.5-2.5	?	Early Child	Low Status	0	?	?	0	0	0	0	0	0			0
T 126		8.5-13.5	?	Late Child	Low Status	0	?	?	?	0	0	0	0	0			0
T 127		0.5-1	?	Infant	Low Status	?	?	?	0	?	0	0	0	0			0
T 128		3-9 m	?	Infant	Low Status	?	?	?	0	?	0	0	0	0			0
T 129-1		25-35	M?	Young Male	Middle Status (fisherman)	0	1	0	?	0	0	0	0	0	T9? (body, AM)	I	1
T 129-2		30-40	M	Young Male	Middle Status (fisherman)	1	0	0	?	1	0	0	0	?	L parietal (post, 7.7 x 6.7 mm, AM)	II	1
T 130		25-35	F	Young Female	Low Status (weaver)	0	0	0	?	0	0	0	0	?			0
T 131		1-2	?	Early Child	Low Status	?	?	?	?	0	?	0	?	0			0
T 132		25-35	M	Young Male	Middle Status (weaver?)	0	1	0	1	0	0	0	0	0	L tibia (P1/3, AM); 5th PP of the R foot (DE, AM); R 10th rib (angle, AM)	II	1
T 134		19-24	F	Young Female	Low Status (weaver)	?	0	1	?	?	0	?	0	0	L4 (spondylolysis, AM)	I	1
T 135-1		0.5-1	?	Infant	Low Status	?	?	?	?	?	?	0	0	0			0
T 136		1.5-2.5	?	Early Child	Low Status	?	?	?	?	?	?	?	?	0			0
T 140		peri-	?	Infant	Low Status	?	?	?	?	?	0	0	0	?			0

		natal															
T 141-1		0.5-1	?	Infant	Low Status (associated with weaver)	?	?	0	?	?	?	0	?	?			0
T 141-2		3-4	?	Early Child	Low Status (associated with weaver)	0	?	?	?	0	0	0	?	0			0
T 141-4		2-3	?	Early Child	Low Status (weaver)	?	?	0	?	0	?	0	0	0			0
T 143		0.5-1	?	Infant	Middle Status	?	?	?	?	?	?	?	?	0			0
T 144		2-4	?	Early Child	Low Status	?	?	?	?	?	?	?	?	?			0
T 145		1-2	?	Early Child	Low Status	?	?	?	?	?	?	0	0	?			0
T 146		9.5-14.5	?	Late Child	Low Status	?	?	?	0	0	0	?	?	0			0
T 147		4-8	?	Late Child	Low Status (weaver)	0	?	0	?	0	0	0	?	0			0
T 148		25-35	F	Young Female	Low Status	?	?	?	?	0	?	?	0	?			0
T 149		16-19	F	Adolescent	Low Status	1	0	0	?	0	1	0	0	0	Frontal (L, 8.6 x 3 mm, AM)	II	1
T 150-1		9.5-14.5	?	Late Child	Low Status (weaver)	?	?	?	?	?	0	?	?	0			0
T 150-2		7-10	?	Late Child	Low Status (weaver)	0	?	?	?	0	0	0	?	0	Possibly in L ulna (D1/3, AM)		0

T 151		30-45	F	Middle Adult Female	Low Status (weaver)	?	0	1	?	?	0	0	0	?	L5 (spondylolysis, AM)	I	1
T 152		25-35	F	Young Female	Low Status (weaver)	?	?	?	?	?	0	?	0	0			0
T 153		20-35	F?	Young Female	Low Status (weaver)	?	?	0	?	?	?	0	0	0			0
T 154		35-45	F	Middle Adult Female	Low Status (weaver)	?	?	0	?	0	?	?	0	0			0
T 155		25-35	M?	Young Male	Middle Status (fisherman)	0	?	?	?	0	0	0	?	0			0
T 156-2		25-35	M?	Young Male	Low Status	?	?	?	?	0	?	?	?	0			0
T 157-1		2-3	?	Early Child	Low Status	?	?	?	?	0	0	?	?	0			
T 157-2		peri-natal	?	Infant	Low Status	?	1	0	?	0	?	0	?	0	L clavicle (acromial end, AM)	I	1
T 158		25-35	M	Young Male	Middle Status (fisherman)	?	1	?	?	?	?	?	0	0	5th PP of the R foot (DE, AM)	I	1
T 159		35-50	M	Middle Adult Male	Low Status	0	0	0	?	0	0	0	0	?			0
T 160		25-35	F	Young Female	Low Status	?	0	0	?	?	?	0	0	0			0
T 161		35-45	M	Middle Adult Male	Low Status	1	1	0	?	0	1	0	0	0	Frontal (R, 7.9 x 5.7 mm, AM); 5th? PP of the L foot (DE, AM)	II	1
T 162		3-4	?	Early	Low Status	?	?	?	?	?	0	?	?	?			0

				Child													
T 163		peri-natal	?	Infant	unknown	?	?	?	?	?	?	?	?	?			0
T 164		3-9 m	?	Infant	unknown	?	?	?	?	?	?	?	?	?			0
T 119/ 165-1		20-23	M	Young Male	Middle Status (fisherman)	0	0	0	?	0	0	0	0	0			0
T 119/ 165-2		20-35	F	Young Female	Middle Status (weaver)	0	1	0	?	0	0	0	0	0	L radius (Colles' Fx, AM); 5th PP of the R foot (DE, AM)	I	1
T 119/ 165-3		35-45	M	Middle Adult Male	Low Status (associated with fisherman and weaver)	?	0	1	1	?	0	0	0	0	L5 (spondylolysis, AM); L 10th rib (neck, AM)	II	1
T 166		0.5-1	?	Infant	Low Status	?	?	?	?	0	?	0	?	0			0
T 167		25-35	F	Young Female	Low Status (weaver)	?	?	?	?	?	?	0	0	?			0
Caja 5		0.5-2	?	Early Child	unknown	?	?	?	?	?	?	?	?	?			0
T 201		20-23	M	Young Male	Low Status	0	0	0	?	0	0	0	0	?			0
T 203		14-16	?	Adolescent	Low Status (weaver)	0	?	?	0	0	0	0	?	0			0
T 204		25-45	M?	Middle Adult Male	Middle Status (fisherman)	?	?	?	?	?	?	0	?	0			0
T 205		25-35	M	Young Male	Low Status	?	?	?	?	?	?	?	0	?			0
T 207		25-35	F	Young	Middle Status	0	0	0	?	0	0	0	?	0			0

				Female	(weaver)												
T 209		20-35	F	Young Female	Low Status (weaver)	?	1	0	?	?	?	?	?	?	L1? (body, AM)	I	1
T 210		0-9 m	?	Infant	Low Status	?	?	?	?	?	?	?	?	0			0
T 211		20-30	M	Young Male	Middle Status	?	1	?	?	0	0	?	?	0	R humerus (humerus varus deformity, AM)	I	1
T 212		20-25	F	Young Female	Low Status	0	0	0	?	0	0	0	0	0			0
T 214		2-3	?	Early Child	Low Status	?	?	?	?	0	0	?	?	0			0
T 215		30-40	M	Middle Adult Male	Middle Status (fisherman)	0	1	0	?	0	0	0	?	0	R tibia (D1/3, AM); 5th PP of the R foot (DE, AM); possibly in 5th PP of the L foot (DE, AM)	I	1
T 216		25-35	F	Young Female	Low Status	?	?	?	?	?	?	0	?	?			0
T 217		25-35	M?	Young Male	Low Status	?	?	?	?	?	0	?	?	0			0
T 218		17-35	M?	Young Male	Low Status	0	?	0	?	0	0	0	0	0			0
T 219		20-30	M?	Young Male	Low Status	0	1	?	?	0	0	0	?	?	2nd? PP of the R hand (PE, AM)	I	1
T 220		3-5	?	Early Child	Low Status (grinder?)	?	?	?	?	?	?	?	?	0			0
T 222		35-45	M	Middle Adult Male	Low Status	?	?	?	?	?	?	0	0	?	Possibly in R 6th-9th rib (angle, AM)		0

T 225		17-45	F?	Adult Female	Low Status (weaver)	?	?	?	?	?	0	?	?	?			0
T 226		20-30	F?	Young Female	Low Status	?	?	?	?	?	0	0	?	0			0
T 229		13-17	?	Adolescent	Low Status (weaver)	0	?	0	?	0	0	0	?	0			0
T 230		20-35	M	Young Male	Low Status	0	?	0	?	0	0	0	0	?			0
T 231		30-40	F?	Middle Adult Female	Low Status (weaver)	?	?	?	?	?	0	?	?	?			0
T 232		9.5-14.5	?	Late Child	Low Status	?	?	?	?	?	0	0	0	0			0
T 233-1		25-35	M?	Young Male	Low Status (weaver)	?	?	?	?	?	0	?	?	0			0
T 233-2		17-45	F?	Adult Female	Low Status (weaver)	?	?	?	?	0	0	?	?	?			0
T 234-1		25-35	M	Young Male	Low Status	?	?	?	?	0	0	?	0	?	Possible PM Fx on L parietal		0
T 234-2		20-30	F	Young Female	Low Status	?	?	?	?	?	0	?	?	?			0
T 235		17-25	F?	Young Female	Low Status	?	?	0	?	0	?	?	0	?			0
T 236		20-35	F	Young Female	Low Status	0	0	0	?	0	0	0	?	0			0
T 237		20-30	M	Young Male	Low Status	0	?	0	?	0	0	0	0	0			0

T 238		25-35	F	Young Female	Low Status (weaver)	?	?	0	?	?	?	0	0	?			0
T 240		20-30	F?	Young Female	Low Status	?	?	0	?	?	?	0	0	?			0
T 241		25-40	F	Middle Adult Female	Middle Status (weaver, fisherman)	?	0	0	?	?	0	?	0	0			0
T 243		1-2	?	Early Child	Low Status	?	?	?	?	?	?	0	0	?			0
T 244		20-35	F	Young Female	Low Status	0	0	0	?	0	0	0	?	0	Possibly in T3 (body, AM)		0
T 245		20-30	M	Young Male	Low Status	?	0	0	?	0	?	0	0	0			0
T 248		20-30	M	Young Male	Middle Status (fisherman)	0	1	0	?	0	0	0	0	0	R radius (Colles' Fx, AM)	I	1
T 249		3-4	?	Early Child	Low Status	?	?	?	?	?	?	?	?	?			0
T 250		20-30	F	Young Female	Low Status	?	?	?	?	?	?	?	?	?			0
T 252		20-30	F	Young Female	Low Status (weaver)	0	?	0	?	0	0	0	0	?			0
T 254		peri-natal	?	Infant	Low Status	?	?	0	?	0	0	?	?	0			0
T 255		1.5-2.5	?	Early Child	Low Status	?	?	?	?	0	?	?	?	0			0
T 257		25-35	M?	Young Male	Low Status	0	?	0	?	0	0	0	?	?			0

T 301		20-35	M	Young Male	Low Status	?	1	0	?	?	?	0	0	?	R fibula (D1/3, AM)	I	1
T 302		35-45	F	Middle Adult Female	Low Status	?	1	0	?	?	?	0	0	?	R radius and ulna (Colles' Fx, AM)	I	1
T 303		20-35	M?	Young Male	Low Status	0	?	?	?	0	0	0	?	?			0
T 304-1		25-35	M?	Young Male	Low Status	?	?	?	?	?	?	0	0	?			0
T 305		25-35	F?	Young Female	Low Status (weaver)	?	?	?	?	?	?	?	?	?			0
T 306		25-35	F?	Young Female	Low Status	1	?	?	?	?	?	1	?	?	L ulna (D1/3, AM)	I	1
T 307-1		20-30	M?	Young Male	Low Status	?	1	?	?	?	?	0	?	?	PP of the R? foot (DE, AM)	I	1
T 307-2		6-10	?	Late Child	Low Status	?	?	?	?	?	?	0	?	?			0
T 308		20-30	F	Young Female	Low Status	?	?	?	?	?	?	?	?	?			0
T 309		20-35	F	Young Female	Low Status	?	1	?	?	?	?	?	?	?	L5? (body, AM)	I	1
T 310		25-40	F	Middle Adult Female	Low Status (weaver)	?	1	?	?	?	?	0	0	?	5th PP of the L foot (DE, AM)	I	1
T 311-1		adult	M?	Adult Male	Middle Status (associated with fisherman)	?	?	?	?	?	?	?	?	?			0
T 311-2		30-45	M?	Middle Adult Male	Middle Status (fisherman)	?	?	?	?	?	?	?	?	?			0

T 312		peri-natal	?	Infant	Low Status	?	?	?	?	?	?	0	?	?			0
T 313		30-40	M?	Middle Adult Male	Low Status (weaver)	?	?	0	?	?	?	?	?	?			0
T 314		0-0.5	?	Infant	Low Status	?	?	?	?	?	?	?	?	?			0
T 316		30-50	F	Middle Adult Female	Low Status	?	?	?	?	?	?	0	0	?			0
T 317		20-35	M?	Young Male	Low Status	?	?	?	?	?	?	0	?	?			0
T 318		35-45	M?	Middle Adult Male	Low Status	1	?	0	?	1	?	0	0	?	Occipital and L parietal (post, BFT, PM)	IV	1
T 320		20-35	F?	Young Female	Low Status	?	?	?	?	?	?	?	?	?			0
T 321		20-35	M?	Young Male	Middle Status (fisherman)	?	0	?	?	?	?	0	0	?			0
T 323		peri-natal	?	Infant	Low Status	?	?	?	?	?	?	?	?	?			0
T 324		30-45	M	Middle Adult Male	Low Status	0	0	0	1	0	0	0	0	?	5th R rib (SE, AM)	II	1
T 325		peri-natal	?	Infant	Low Status	?	?	?	?	?	?	0	0	?			0
T 326		2-3	?	Early Child	Low Status	?	?	?	?	?	?	0	?	?			0
T 327		30-40	F	Middle Adult Female	Low Status	0	1	?	?	0	0	0	0?	?	5th PP of the R? foot (DE, AM)	I	1

T 329		2-4	?	Early Child	Low Status	?	?	?	?	?	?	?	?	?			0
T 331		peri-natal	?	Infant	Low Status	?	?	?	?	?	?	?	?	?			0
T 332		25-35	F	Young Female	Low Status (weaver)	?	?	?	?	?	?	?	?	?			0
T 333		25-35	M?	Young Male	Middle Status (fisherman)	?	?	?	?	?	?	?	?	?			0
T 334		1-2	?	Early Child	Low Status	?	?	?	?	?	?	?	?	?			0
T 336		peri-natal	?	Infant	Low Status	?	?	?	0	?	?	0	?	?			0
T 337		30-45	F	Middle Adult Female	Low Status (weaver)	?	?	?	?	0	0	?	0	?			0
T 338		3-9 m	?	Infant	Low Status	?	?	?	?	?	?	0	?	?			0
T 339		17-35	F?	Young Female	Low Status (weaver)	?	?	?	?	?	?	0	?	?			0
T 340		25-35	F?	Young Female	Low Status (weaver)	?	?	?	?	?	?	?	?	?			0
T 341		3-9 m	?	Infant	Low Status	?	?	?	?	?	?	?	?	?			0
T 342		2-4	?	Early Child	Low Status	?	?	?	?	?	?	?	?	?			0
T 343		1-2	?	Early Child	Low Status	?	?	?	?	?	?	?	?	?			0
T 345		35-50	M	Middle Adult Male	Low Status (weaver)	0	1	?	?	0	0	0	?	?	5th PP of the R foot (DE, AM)	I	1

T 346		20-30	F?	Young Female	Low Status (weaver)	?	?	?	?	?	?	0	?	?			0
T 347		peri-natal	?	Infant	Low Status	?	?	?	?	?	?	?	?	?			0
T 349		0-1	?	Infant	Low Status (weaver)	?	?	?	?	?	?	0	?	?			0
T 350		25-35	M?	Young Male	Low Status	1	?	1	?	?	1	0	?	?	Frontal (R, 6 x 5 mm, AM); L5 (spondylolysis, AM)	II	1
T 351		1-2	?	Early Child	Low Status	?	?	?	?	?	?	?	?	?			0
T 352		2-4	?	Early Child	Low Status	?	?	?	?	0	0	?	?	?			0
T 353		30-45	F?	Middle Adult Female	Low Status (weaver)	?	?	?	?	?	?	?	?	?			0
T 354		0.5-1	?	Infant	Low Status	?	?	?	?	?	?	?	?	?			0
T 355		0.5-1	?	Infant	Low Status	?	?	?	?	?	?	?	?	?			0
T 356		30-40	M?	Young Male	Low Status	?	1	?	?	?	?	?	?	?	R tibia (M1/3, DE, AM); 5th PP of the R foot (DE, AM)	I	1
T 357		3-4	?	Early Child	Low Status	?	?	?	?	?	?	0	?	?			0
T 359		35-45	M	Middle Adult Male	Low Status	1	?	?	?	?	?	1	?	?	R ulna (M1/3, AM)	I	1
T 360		peri-natal	?	Infant	Low Status	?	?	?	?	?	?	?	?	?			0

T 361		0.5-1	?	Infant	Low Status	0	?	?	?	0	0	0	?	?			0
T 362		peri-natal	?	Infant	Low Status	?	?	?	?	?	?	?	?	?			0
T 363		25-35	M?	Young Male	Low Status	?	?	?	?	?	?	0	?	?			0
T 364		20-30	M?	Young Male	Low Status	?	1	?	?	?	?	0	?	?	2nd L metatarsal (PE, AM); 5th PP of the L foot (DE, AM)	I	1
T 365		0.5-1	?	Infant	Low Status	0	?	?	0	0	0	0	?	?			0
T 366		3-9 m	?	Infant	Low Status	0	?	?	0	0	0	0	?	?			0
T 367		17-20	M?	Young Male	Low Status	?	1	0	?	?	?	0	0	?	5th PP of the R foot (PE, AM); possibly in 5th PP of the L foot (DE, AM)	I	1
T 368		20-30	F	Young Female	Low Status (weaver)	?	1	?	?	?	?	0	?	?	T3?-T5? & L2-L3 (bodies, AM)	I	1
T 369		peri-natal	?	Infant	Low Status	?	?	?	?	?	?	0	?	?			0
T 370		2-4	?	Early Child	Low Status	?	?	?	?	?	?	?	?	?			0
T 371		19-25	M	Young Male	Low Status	1	?	0	?	1	?	?	0	?	L parietal (sup, 18.04 x 16.75 mm, AM)	III	1
T 372		30-40	F	Middle Adult Female	Low Status (weaver)	?	0	0	?	?	?	0	0	?			0
T 373		35-45	F	Middle Adult Female	Low Status (weaver)	?	0	?	0	?	?	0	0	?			0

T 374		35-50	F	Middle Adult Female	Low Status	?	0	?	?	?	?	0	0	?			0
T 375		45+	M	Old Male	Middle Status (fisherman)	0	?	?	?	0	0	0	?	?			0
T 376		25-35	M	Young Male	Low Status	0	1	?	0	0	0	0	0	?	L patella (AM)	I	1
T 377		25-35	F	Young Female	Low Status (musician)	0	?	0	0	0	0	0	0	?			0
T 378		30-45	F?	Middle Adult Female	Low Status (weaver)	?	?	?	?	?	?	0	?	?	Possibly in L parietal (post, 6.95 x 5.47 mm, AM)		0
T 380		25-35	M	Young Male	Middle Status (fisherman)	0	0	?	?	0	0	0	0	?			0
T 381		40-60	F	Middle Adult Female	Low Status (weaver)	1	0	?	?	0	1	0	0	?	R zygomatic (malar tubercle, 9.2 x 7 mm, AM)	I	1
T 382		35-45	F	Middle Adult Female	Low Status (weaver)	1	0	?	?	1	?	0	0	?	Parietal (unknown location, 8.9 x 7.7 mm, AM)	II	1
T 383		25-40	F?	Young Female	Low Status (weaver)	?	1	?	?	?	?	?	?	?	MP of the L foot (PE, AM)	I	1
T 384		1-2	?	Early Child	Low Status	?	?	?	?	?	0	0	0	?			0
T 385		25-35	M?	Young Male	Low Status	?	?	?	?	?	?	0	?	?			0
T 386		20-30	M	Young Male	Low Status	?	?	0	?	?	?	0	?	?			0
T 387		25-35	F	Young	Low Status	?	?	?	?	?	?	0	?	?			0

				Female													
T 388		20-30	M	Young Male	Low Status	?	?	?	?	?	?	0	?	?			0
T 389		60+	F	Old Female	Low Status	?	?	?	?	?	?	0	?	?			0
T 390		3-9 m	?	Infant	Low Status	?	?	?	?	?	?	0	?	?			0
T 391		20-25	M?	Young Male	Low Status	?	?	?	?	?	?	0	?	?			0
T 392		adult	M?	Adult Male	Middle Status	?	1	?	?	?	?	?	?	?	5th PP of both feet (DE, AM)	I	1
T 393		17-35	M?	Young Male	Low Status	?	?	?	?	?	?	?	?	?			0
T 394		1.5-2.5	?	Early Child	Low Status	?	?	?	?	?	?	?	?	?			0
T 395		30-45	M?	Middle Adult Male	Low Status	?	?	?	1	?	?	?	?	?	6th-9th L rib (angle, AM); R rib (body, AM)	II	1
T 396		25-35	F?	Young Female	Low Status	?	?	?	?	?	?	?	?	?			0
T 398		25-35	M	Young Male	Low Status	?	?	?	?	?	?	0	?	?			0
T 399		7.5-12.5	?	Late Child	Low Status	?	?	?	?	?	?	?	?	?			0
T 400		35-50	M?	Middle Adult Male	Middle Status	?	1	?	?	?	?	0	?	?	4th and 5th PP of the R foot (DE, AM)	I	1
T 401		30-45	M?	Middle	Low Status	?	?	?	?	?	?	?	?	?			0

				Adult Male													
T 402		4-6	?	Early Child	Low Status	0	?	?	?	0	0	0	?	?			0
T 403		30-40	F	Young Female	Low Status (grinder?)	?	?	?	?	?	?	0	?	?			0
T 404		17-20	M	Young Male	Middle Status (fisherman)	?	?	?	?	?	?	0	?	?			0
T 405		1-1.5	?	Early Child	Low Status	?	?	?	?	?	?	?	?	?			0
T 406		30-50	F	Middle Adult Female	Low Status	1	?	?	?	1	?	0	?	?	Lambdatic bone (30.7 x 4.4 mm, S-BFT, PM)	IV	1

?

Appendix VI: Summary Data for Copacabana

Code	Sector	Age	Sex	Cohort	Social Group	Mal-intent	Acci-dental	Occupa-tional	Un-known	Vault	Face	Parry FX	Boxer's Fx	Teeth	Brief description	Lethality	MNEv
B03 E1	B	25-35	F	Young Female	Low Status (weaver)	?	?	0	0	0	?	0	0	?			0
B03 E2	B	2-3	?	Early Child	Middle Status	0	?	?	0	0	0	0	0	?			0
B04 E1	B	40-55	M	Middle Adult Male	Low Status (dyer or painter)	1	1	0	1	1	1	0	0	?	Frontal (R, 10.6 x 8.5 mm, AM); frontal (R supraorbital margin, 14.5 x 6.6 mm, AM); mandible (L condyle, AM); R ulna (M1/3, AM - Monteggia Fx); R radius (Colles' Fx, AM); L scapula (glenoid fossa, AM); L clavicle (acromial end, AM); L1 (R transverse process, AM); L2 (R superior articular process, AM); L fibula (D1/3, AM); 1st DP of the R foot (PE, AM); 5th PP of both feet (DE, AM); 5th MP of the L foot (PE, AM); R 5th and 6th ribs (SE, AM); and possibly in R nasal (AM); 2nd PP of the L foot (PE, AM); and 11th and 12th ribs of both sides (SE, AM).	III	2
B04 E2	B	2-3	?	Early Child	Low Status	0	?	0	0	0	0	0	0	?			0

B04 E3	B	40-50	M	Middle Adult Male	Low Status	1	1	0	0	?	1	0	0	?	L nasal (AM); L radius and L ulna (Colles' Fx, AM); 1st PP of the L foot (DE, AM)	I	1
B04 E4	B	1-2	?	Early Child	Low Status	0	?	0	0	0	0	0	0	?			0
B05 E1	B	1-1.5	?	Early Child	Low Status	?	?	?	0	0	0	?	?	?			0
B06 E1	B	4-5	?	Early Child	Low Status	?	?	?	0	0	?	?	?	?			0
B06 E2	B	50+	F?	Old Female	Low Status (weaver)	?	1	0	0	0	0	?	?	?	4th MP of the R foot (PE, AM). Possibbly in 5th MP of the R foot and T11-T12 (bodies, AM)	I	1
B07 E1	B	20-25	F	Young Female	Low Status	?	?	?	0	0	0	?	?	?			0
B07 E2	B	2-4	?	Early Child	Low Status	?	?	?	?	?	?	?	?	?			0
B11 E1	B	35-45	M	Middle Adult Male	Low Status	1	1	0	1	1	1	0	0	?	Frontal (L, 5.3 x 2.7 mm, AM); frontal (R, 5.7 x 4.0 mm, AM); R parietal (sup-ant, 39.2 x 21.3 mm, AM); L parietal (lateral, 9.9 x 6.4 mm, AM); 3rd MP and DP of the L? hand (DIP, AM); 5th MP of the R foot (PE, AM); L 6th, 7th or 8th rib (body, AM); possibly in R radius (Colles' Fx, AM)	III	1

B12 E1	B	20-30	F	Young Female	Low Status	1	1	0	0	1	?	0	0	?	Frontal (L, 21.5 x 19.5 mm, AM); R parietal (post, 55 x 38.5 mm, AM); coccyx (DE, AM)	III	2
B12 E2	B	5-6	?	Late Child	Low Status (weaver)	?	?	?	1	?	0	0	0	?	R rib (neck, AM -close to the death)	IV	1
B19 E1	B	20-25	M?	Young Male	Low Status	?	?	?	1	0	0	?	?	?	R 3rd rib (SE, AM)	II	1
B19 E2	B	45+	M?	Old Male	Low Status (weaver)	?	1	?	1	0	0	?	?	?	5th PP of the R foot (DE, AM); 2nd MP of the R foot (PE, AM); two R ribs (S1/3, SE, AM); L 2nd? rib (S1/3?, AM)	III	1
B123 E1	B	35-50	F	Middle Adult Female	Low Status	0	1	0	0	0	0	0	?	?	1st DP of the R hand (PE, AM); 4th MP of the L? hand (PE, AM); 1st and 2nd DP of the R foot (PE, AM)	I	1
B123 E2	B	15-17	F	Adolescent	Low Status	?	0	0	0	?	0	0	0	?			0
B127 E1	B	25-30	M?	Young Male	Low Status	?	1	0	1	0	?	0	0	?	1st PP of the R hand (PE, AM); L 2nd rib (S1/3, AM); L 9th-11th, R 8th, and possibly in L 8th ribs (angles, AM)	III	1
B130 E1	B	1.5-2.5	?	Early Child	Low Status	?	?	?	?	0	?	0	?	?			0
B131 E1	B	25-35	F	Young Female	Low Status	0	1	0	0	0	0	0	0	?	2nd PP of the hand (shaft, AM)	I	1
B131 E2	B	25-35	M	Young Male	Low Status	0	?	?	0	0	0	0	0	?			0

B131 E3	B	19-23	M	Young Male	unknown	?	?	?	1	?	0	0	0	?	L 3rd? rib (SE, AM)	II	1
B134 E1	B	25- 40	F	Young Female	Low Status	?	?	?	?	0	0	?	0	?			0
B135 E2	B	20- 35	F?	Young Female	Low Status	?	?	?	?	?	?	?	?	0			0
B136 E3	B	25-35	M?	Young Male	Low Status (weaver)	?	?	?	1	?	?	0	0	?	L 7th, 8th, or 9th rib (angle, AM)	II	1
B142 E1	B	25-35	F	Young Female	Low Status	?	?	0	0	?	0	0	0	?			0

Appendix VII: Summary Data for Ancón

Code	Sector	Age	Sex	Cohort	Social Group	Mal-intent	Acci-dental	Occupa-tional	Un-known	Vault	Face	Parry FX	Boxer's Fx	Teeth	Brief description	Lethality	MNEv
CF 01	Miramar	35-50	F	Middle Adult Female	High Status (weaver)	?	0	0	0	?	0	0	0	0			0
CF 02	Miramar	0.5-1	?	Infant	Low Status	?	?	0	0	?	0	0	0	0			0
CF 03-I	Miramar	0.5-1	?	Infant	High Status (associated with weaver)	0	?	0	0	0	0	0	0	0			0
CF 03-II	Miramar	15-17	F	Adolescent	High Status (weaver)	0	0	0	1	0	0	0	0	0	L 11th rib (SE, AM)	II	1
CF 04	Miramar	peri-natal	?	Infant	Low Status	0	?	?	0	0	0	0	0	0			0
CF 05	Miramar	0.5-1	?	Infant	Low Status	0	?	0	0	0	0	0	0	0			0
CF 06	Miramar	peri-natal	?	Infant	Low Status	0	?	0	0	0	0	0	0	0			0
CF 07-I	Miramar	15-17	F	Adolescent	High Status	0	0	0	0	0	0	0	0	0			0
CF 07-II	Miramar	peri natal	?	Infant	High Status	?	?	?	0	?	?	0	?	0			0
CF 08-I	Miramar	40-50	M	Middle Adult Male	High Status (soldier)	0	?	0	1	0	0	0	0	0	L and R 2nd ribs (SE, AM)	II	2

CF 08-II	Miramar	40-50	M	Middle Adult Male	High Status (soldier)	1	1	0	1	0	1	0	0	?	Nasals (AM); T7 and T10 (bodies, AM); L3 (L transverse process, AM); 2nd, 3rd, & 5th PP of the R foot (DE, AM); 2nd MP of the R foot (PE, AM); sternum (body, AM); L 3rd-4th & R 5th ribs (SE, AM); R 6th, 8th & 10th ribs (S1/3, AM)	III	1
CF 08-X	Miramar	0.5-1	?	Infant	Retainer (associated with soldier)	?	?	0	0	?	0	?	0	0			0
CF 08-Y	Miramar	45+	F	Old Female	Retainer (associated with soldier). Sacrifice?	1	?	?	0	1	0	0	?	?	PM comminution (BFT) on the L parietal (lateral), occipital (L), and L zygomatic. Possibly by a single hit to the left side of the vault.	IV	1
CF 09	Miramar	6-9 m	?	Infant	Middle Status	?	?	0	0	?	0	0	0	0			0
CF 10	Miramar	3-4	?	Early Child	Low Status (weaver)	0	?	0	0	0	0	0	0	0			0
CF 11	Miramar	1-2	?	Early Child	Low Status	0	?	0	0	0	0	0	0	0			0
CF 12	Miramar	50+	M	Old Male	High Status	1	?	0	?	0	1	0	0	?	Nasals (AM)	I	1
CF 13	Miramar	peri-natal	?	Infant	Low Status	0	?	0	0	0	0	0	0	0			0
CF 14-I	Miramar	35-45	F	Middle Adult Female	Low Status (weaver)	0	1	0	1	0	0	0	0	0	3rd? MP of the R foot (PE, AM); R 2nd, 5th & 6th ribs (SE, AM)	II	2

CF 14-II	Miramar	30-45	M	Middle Adult Male	High Status	1	1	0	0	0	1	0	0	?	L nasal (AM); R tibia (DE, AM); R fibula (D1/3, AM); possibly in 5th PP and MP of the hand (PIP, AM); and in 5th PP of the L foot (DE, AM)	I	1
CF 14-III	Miramar	25-35	F	Young Female	Low Status	0	1	0	0	0	0	0	0	0	5th MP of the L foot (PE, AM)	I	1
CF 14-X	Miramar	50+	F	Old Female	Retainer	0	1	0	1	0	0	0	0	?	2nd? MP, 3rd? MP, and 5th DP of the L hand (PE, AM); 2nd PP of the L foot (PE, AM); L1-L3 (L transverse processes, AM); R rib (SE, AM); L rib (SE, AM)	II	1
CF 14-Y	Miramar	peri-natal	?	Infant	Retainer	?	?	?	?	?	0	0	0	0			0
CF 15-I	Miramar	3-4	?	Early Child	Low Status	0	?	0	0	0	0	0	0	0			0
CF 15-II	Miramar	6-9 m	?	Infant	Low Status	0	?	0	0	0	0	0	0	0			0
CF 16	Miramar	17-23	M	Young Male	High Status (musician)	?	?	?	?	?	?	0	?	?			0
CF 17	Miramar	6-8	?	Late Child	Low Status	0	0	0	0	0	0	0	0	0			0
CF 18	Miramar	17-20	M	Young Male	Middle Status (musician)	1	?	?	0	1	1	0	0	?	R parietal (lateral, 15 x 5 mm aprx, S-BFT, PM); PM comminution of the facial area; possible PM Fx in R 6th rib (angle), L 3rd rib (angle and S1/3), L 10th rib (body)	V	1

															and teeth 28, 33, and 36.		
CF 19	Miramar	4-6	?	Early Child	Low Status	0	?	0	0	0	0	0	0	0			0
CF 20	Miramar	3-4	?	Early Child	Low Status	0	?	0	0	0	0	0	?	0			0

Appendix VIII: Summary Data for Armatambo

Code	Sector	Age	Sex	Cohort	Social Group	Mal-intent	Acci-dental	Occupa-tional	Un-known	Vault	Face	Parry FX	Boxer's Fx	Teeth	Brief description	Lethality	MNEv
CF 05 A	22 de Oct	30-40	F	Middle Adult Female	Middle Status	0	1	0	0	0	0	0	0	0	Both cuboids (CC joint, AM); R 5th metatarsal (PE, AM); L 5th metatarsal (DE, AM); possibly in R 4th metatarsal (shaft, AM)	I	2
CF 10 A	22 de Oct	40- 50	M	Middle Adult Male	Middle Status	0	1	1	1	0	0	0	0	0	1st PP of the hand (DE, AM); 5th PP of the R foot (DE, AM); R 3rd metatarsal (DE, AM); L5 (spondylolysis, AM); L 9th rib (angle, AM); L 11th rib (body, AM)	II	1
CF 13	22 de Oct	25-35	M	Young Male	Low Status	1	1	0	1	0	1	0	0	?	L nasal (AM); 5th PP of the L foot (DE, AM); L 4th? rib (SE and body, AM); L 5th? rib (SE, AM; S1/3, PM); L 6th rib (SE and S1/3, AM); R 4th? rib (SE and S1/3, AM); R 7th rib (SE, BFT, PM); and possibly in 3rd PP of the R? hand (DE, AM)	IV	2
CF	22 de	0-1	?	Infant	Low Status	?	?	?	?	?	?	?	?	?			0

17	Oct																
CF 20	22 de Oct	35-45	F	Middle Adult Female	Low Status	1	1	0	0	1	0	0	0	0	Frontal (midline-sup, 13.1 x 12.4 mm, BFT, PM); L 1st cuneiform (AM); L 4th metatarsal (PE, AM)	IV	2
CF 27	22 de Oct	1.5-2.5	?	Early Child	Low Status	?	?	0	0	0	?	0	0	?			0
CF 30	22 de Oct	25-35	F	Young Female	Low Status (weaver)	1	?	0	1	1	0	0	0	0	L parietal (post, 14.9 x 9.4 mm, AM); R 3rd rib (SE, AM); R 8th and L 10th ribs (angles, AM)	III	1
CF 31	22 de Oct	50+	F	Old Female	High Status (weaver)	1	1	0	1	0	1	0	0	?	Both nasals (AM); 1st PP of the R foot (DE, AM); R 2nd-5th and L 2nd-6th ribs (SE, AM)	III	1
CF 35	22 de Oct	30-45	F	Middle Adult Female	High Status	0	1	0	1	0	0	0	0	?	T11 (body, AM-close to the death); DP of the hand (PE, AM); L 5th metatarsal (DE, AM); 5th PP of the R foot (DE, AM); R 2nd-6th and L 4th-7th ribs (SE, AM)	IV	4
CF 55	22 de Oct	0.5-1	?	Infant	Low Status	?	?	?	0	?	0	0	?	0			0
CF 56	22 de Oct	40-60	F	Old Female	Low Status	0	1	1	0	0	0	0	0	?	L 1st metacarpal (PE, AM); L5 (spondylolysis, AM); possibly in 5th PP of the R foot (PE, AM)	I	1

CF 57	22 de Oct	25-35	F	Young Female	Middle Status	1	?	0	0	1	0	0	0	0	Frontal (L, 9 x 5 mm, AM)	II	1
CF 64 B	22 de Oct	0-1	?	Infant	Low Status	?	?	?	?	?	?	0	?	?			0
CF 68	22 de Oct	0-1	?	Infant	Low Status	?	?	?	?	?	?	0	?	?			0
CF 87	22 de Oct	1-1.5	?	Early Child	High Status	?	?	?	0	?	0	0	?	0			0
CF 88	22 de Oct	40-60	F	Old Female	High Status	0	1	0	1	0	0	0	?	?	5th PP of the R foot (DE, AM); 3rd or 4th DP of the foot (PE, AM); R 3rd-4th ribs (SE, AM)	II	1
CF 94	22 de Oct	30-45	F	Middle Adult Female	Low Status	1	1	0	0	0	1	0	0	0	R nasal (AM); 5th PP of the R foot (PE, AM); L3 (transverse process, AM)	I	1
CF 95	22 de Oct	25-35	M	Young Male	Low Status	1	1	0	1	1	0	0	?	?	Frontal (R, 8 x 8.5mm, AM); T4 (body, AM); R clavicle (AM); sesamoid (AM); sternum (PNBF, L DE, AM); L 6th rib (S1/3, AM); L 5th & 7th, R 2nd & 7th (SE, AM); L 3rd and 5th ribs (tubercle, BFT, PM); and possibly in R 3rd (SE, AM), L 2nd rib (neck, BFT, PM), and 5th PP of the R foot (DE, AM)	IV	2

CF 97	22 de Oct	30-45	F	Middle Adult Female	Middle Status	0	1	0	1	0	0	0	0	?	L femur (M1/3, AM); R 4th-5th ribs (SE, AM); R 10th rib (angle, AM)	III	1
CF 100	22 de Oct	1-2	?	Early Child	High Status	?	?	?	0	0	?	0	?	?			0
CF 101 A	22 de Oct	25-35	M	Young Male	Middle Status	1	?	0	0	0	1	0	0	0	Nasals (AM)	I	1
CF 101 B	22 de Oct	0.5-1	?	Infant	Middle Status	?	?	?	0	?	?	0	?	?			0
CF 103	22 de Oct	40-60	M	Old Male	High Status	1	1	0	1	0	1	0	?	?	Frontal (L, 5.9 x 4 mm, AM); L tibia (medial malleolus, AM); navicular of the R foot (TN joint, AM); 5th PP of the L foot (DE, AM); L3 (R transverse process, AM); R 4th-5th rib (S1/3, AM); R 5th, 7th, and 9th; and L 4th-6th ribs (SE, AM); L 8th rib (S1/3, AM - BFT, close to the death); and R 6th-7th ribs (necks, BFT, PM)	IV	4
CF 105	22 de Oct	12-14	?	Adolescent	High Status	1	0	0	0	1	0	0	0	0	Frontal (R, 9.5 x 5 mm, AM)	II	1

CF 106	22 de Oct	30-45	F	Middle Adult Female	High Status	1	1	1	0	0	1	0	?	1	Frontal (R, 11 x 9.4 mm, AM); tooth 13 (AM); 2nd? MP of the R? foot (PE, AM); L5 (spondylolysis, AM); L scapula (body, BFT, PM). Possible PM Fx (BFT) in L R 2nd, 4th, 9th, and 12th ribs (bodies); L 3rd and 10th ribs (bodies); and L 3rd, 5th, 6th, 8th & 9th ribs (S1/3).	IV	2
CF 110	22 de Oct	5-6	?	Late Child	High Status	0	?	0	0	0	0	0	0	?			0
CF 112	22 de Oct	40-50	F	Middle Adult Female	Low Status	0	?	0	1	0	0	0	0	?	R 4th-5th ribs (S1/3, AM); R 7th-8th ribs (bodies, BFT, PM); possibly in T7 (body, AM)	IV	2
CF 114	22 de Oct	35-55	M	Middle Adult Male	High Status	1	1	1	1	0	1	0	?	?	Nasals (AM); R radius (Colles' Fx, AM); L4 (body, AM); L5 (spondylolysis, AM); R 3rd rib (SE, AM); L 5th-7th ribs (SE, AM); L 9th-10th ribs (bodies, AM)	III	2
CF 118	22 de Oct	25-35	F	Young Female	High Status	0	0	0	1	0	0	0	0	0	R 4th rib (S1/3, AM); possibly in R 5th rib (SE, AM)	II	1
CF 121	22 de Oct	35-50	M	Middle Adult Male	Low Status	?	?	?	1	0	0	?	0	?	R 10th rib (angle, AM)	II	1

CF 122	22 de Oct	25-35	M	Young Male	High Status	1	?	0	0	1	0	0	0	0	R parietal (post, 19.4 x 10.5 mm, AM); R parital (sup, 10 x 7 mm aprx, AM)	III	1
CF 124	22 de Oct	25-35	M	Young Male	Middle Status	0	1	0	0	0	0	0	0	0	MP of the foot (PE, AM)	I	1
CF 128 B	22 de Oct	peri-natal	?	Infant	Middle Status	0	?	?	0	0	0	0	0	0			0
CF 130	22 de Oct	25-35	M	Young Male	High Status	0	1	0	0	0	0	0	?	0	5th PP of the R foot (shaft, AM); 5th PP of the L foot (DE, AM)	I	1
CF 132	22 de Oct	25-35	M	Young Male	Middle Status	0	1	0	?	0	0	0	0	?	2nd PP or the L? hand (shaft, AM); R 5th metatarsal (PE, AM)	I	1
CF 138	22 de Oct	0.5-1.5	?	Infant	High Status	?	?	?	0	?	?	0	?	?			0
CF 139	22 de Oct	10-12	?	Late Child	Low Status	0	?	0	0	0	0	0	0	0			0
CF 144 B	22 de Oct	8-10	?	Late Child	High Status	0	?	?	0	0	0	0	?	0			0
CF 145	22 de Oct	30-45	F	Middle Adult Female	Middle Status (weaver)	0	1	?	1	0	0	0	0	0	L femur (P1/2, AM); L 2nd-4th and possibly in L 5th-6th ribs (S1/3, AM)	III	1
CF 147	22 de Oct	16-19	F	Adolescent	Middle Status	0	1	0	0	0	0	0	0	0	1st PP of the hand (PE, AM)	I	1

CF 148	22 de Oct	1-2	?	Early Child	High Status	0	?	0	0	0	0	0	?	0			0
CF 150	22 de Oct	15-17	M	Adolescent	Low Status	1	1	?	0	1	0	0	?	0	R parietal (post, 22 x 11.7 mm, BFT, PM); L parietal (post, 17.5 x 12.2 mm, BFT, PM); L parietal (sup, 19.2 x 11.5 mm, BFT, PM); R scapula (body, BFT, PM); and possible PM Fx (BFT) in R 2nd-3rd & 5th; & L 2nd-4th (bodies); and R 4th rib (angle).	V	1
CF 156	22 de Oct	25-35	M	Young Male	High Status	0	1	0	0	0	0	0	0	0	5th PP and MP of the R? foot (PIP, AM)	I	1
CF 157	22 de Oct	25-35	F	Young Female	Low Status	0	1	0	0	0	0	0	0	0	T11 (body, AM)	I	1
CF 160	22 de Oct	25- 35	F	Young Female	Low Status	0	?	?	0	0	0	0	0	0			0
CF 162 F	22 de Oct	1-1.5	?	Early Child	High Status	0	?	?	?	0	0	0	?	?			0
CF 162 N	22 de Oct	15-17	F	Adolescent	High Status	0	?	0	0	0	0	0	0	0			0
CF 166	22 de Oct	12-14	?	Adolescent	Middle Status	0	1	?	1	0	0	0	?	?	L femur (D1/2, AM); R 5th rib (S1/3, AM)	II	1

CF 169	22 de Oct	30-40	M	Middle Adult Male	High Status	1	1	1	1	1	0	0	0	?	Occipital (17.2 x 9.6 mm, AM); R clavicle (acromial end, AM); L5 (spondylolysis, AM); R 6th rib (S1/3, AM); R 7th-8th ribs (angles, AM); possibly in L ulna (D1/3, AM)	III	1
CF 182	22 de Oct	18-19	M	Young Male	Middle Status	0	?	0	1	0	0	0	0	?	R 3rd rib (SE, AM); possibly in frontal (L, 6.4 x 2 mm, AM)	II	1

X-rays observation

Appendix IX: Summary Data for Pueblo Viejo

Code	Sector	Age	Sex	Cohort	Social Group	Mal-intent	Acci-dental	Occupa-tional	Un-known	Vault	Face	Parry FX	Boxer's Fx	Teeth	Brief description	Lethality	MNEv
CF 01	II	peri-natal	?	Infant	Sacrifice? (herders area)	?	?	?	0	0	?	0	0	?			0
CF 02	II	21-23	M	Young Male	Middle Status (herders area)	0	?	0	0	0	0	0	0	?			0
CF 03-1	II	20-30	F	Young Female	Sacrifice? (herders area)	0	?	0	?	0	0	0	0	0			0
CF 03-2	II	25-35	M	Young Male	Middle Status (herders area)	0	?	1	?	0	0	0	0	?	L5 (spondylolysis, AM)	I	1
CF 03-3	II	1-2	?	Early Child	Middle Status (herders area)	?	?	?	?	0	?	?	0	?			0
CF 04-1	II	16-22	F	Young Female	Middle Status (herders area)	0	?	0	?	0	0	0	?	0			0
CF 04-2	II	25-35	F	Young Female	Middle Status (herders area)	0	?	0	?	0	0	0	?	?			0
CF 04-3	II	1-1.5	?	Early Child	Middle Status (herders area)	?	?	0	?	0	?	?	?	?			0
CF 7	II	16-17	F	Adolescent	Middle Status (herders area)	0	0	0	0	0	0	0	0	0			0
CF 08-1	II	25-35	F	Young Female	Middle Status (herders area)	?	?	0	1	0	?	0	?	?	L 11th rib (angle, AM)	II	1
CF 08-3	II	20-30	F	Young Female	Middle Status (herders area)	0	?	0	?	0	0	0	0	?			0

CF 08-4	II	16-22	M	Young Male	Middle Status (herders area)	1	?	?	?	0	1	0	?	?	Nasals (AM)	I	1
CF 08-5	II	30-40	M	Middle Adult Male	Middle Status (herders area)	0	?	?	?	0	0	0	?	?			0
CF 08-6	II	20-25	M?	Young Male	Middle Status (herders area)	0	?	?	?	0	0	0	0	?			0
CF 08-7	II	3-4	?	Early Child	Middle Status (herders area)	?	?	?	?	0	0	?	?	?			0
CF 08-8	II	12-16	?	Adolescent	Middle Status (herders area)	0	?	0	0	0	0	0	?	?			0
CF 09-1	II	12-16	?	Adolescent	Middle Status (herders area)	?	?	?	?	0	?	0	?	0			0
CF 09-2	II	15-20	?	Adolescent	Middle Status (herders area)	0	?	1	?	0	0	0	?	?	L5 (spondylolysis, AM)	I	1
CF 09-3	II	35-45	F	Middle Adult Female	Middle Status (herders area)	1	?	?	?	1	0	?	?	?	R parietal (sup, 10 x 8 mm, AM)	III	1
EA 28-1	III	2-4	?	Early Child	Middle Status	0	?	0	0	0	0	0	0	0			0
ET3-I	III	35-45	M	Middle Adult Male	Middle Status	0	?	0	0	0	0	0	0	?			0
ET3-II	III	30-45	F	Middle Adult Female	Middle Status	0	?	0	0	0	0	0	?	?			0
ET3-III	III	2-4	?	Early Child	Middle Status	?	?	?	?	?	?	0	?	?			0
ET3-	III	3-4	?	Early	Middle Status	?	?	?	?	0	?	0	?	?			0

IV				Child													
ET3-V	III	5-9	?	Late Child	Middle Status	0	?	0	?	0	0	0	0	0			0
ET3-VI	III	3-9 m	?	Infant	Middle Status	0	?	?	?	0	0	0	?	?			0
ET3-VII	III	3-9 m	?	Infant	Middle Status	0	?	?	?	0	0	0	?	?			0
ET3-VIII	III	1-2	?	Infant	Middle Status	?	?	?	?	?	?	0	?	0			0
ET3-IX	III	30-45	F	Middle Adult Female	Middle Status	1	?	?	?	1	0	0	0	?	Frontal (L, 12 x 1.5 mm, AM); possibly in L 2nd rib (AM)	III	1
ET3-X	III	40-50	F	Middle Adult Female	Middle Status	?	1	?	?	0	?	0	0	0	Both radius (Colles' Fx, AM); DP of the hand (PE, AM); R 2nd metatarsal (PE, AM); possibly in L fibula (P1/3, AM) and L 8th or 9th rib (angle, AM).	I	1
ET5	III	40-60	F	Old Female	Middle Status	1	?	0	1	0	0	1	0	?	R ulna (D1/3, AM); L? 4th?, 5th?, or 6th? rib (SE, AM)	II	1
ET6-I	III	45-60	F	Old Female	Middle Status	?	?	?	1	?	0	0	?	0	R 2nd rib (D1/3, AM) and R 3rd rib (SE, AM)	II	1
ET6-II	III	30-45	F	Middle Adult Female	Middle Status	0	1	?	0	0	0	0	0	0	MP of the hand (DE, AM). But it could belong to another individual.	I	1
ET6-III	III	30-40	M	Middle Adult Male	Middle Status	1	?	?	?	1	0	0	0	?	R parietal (post, AM)	II	1

ET6-IV	III	30-45	M	Middle Adult Male	Middle Status	0	?	?	?	0	0	0	?	?			0
ET6-V	III	17-19	M	Young Male	Middle Status	0	?	?	?	0	0	0	?	?			0
ET6-VI	III	?	?	Late Child	Middle Status	?	?	0	?	0	0	?	0	?			0
ET6-VII	III	20-30	M?	Young Male	Middle Status	0	?	?	?	0	0	0	?	?			0
ET6-VIII	III	40-50	M	Middle Adult Male	Middle Status	0	?	0	0	0	0	0	0	?			0
ET6-IX	III	40-50	F	Middle Adult Female	Middle Status	1	?	?	?	1	0	0	?	?	R parietal (post, 9.5 x 7 mm and 9.9 x 8 mm, AM)	II	1
ET6-X	III	3-9 m	?	Infant	Middle Status	?	?	?	?	?	?	?	?	?			0
ET6-XI	III	3-9 m	?	Infant	Middle Status	?	?	?	?	?	?	?	?	?			0
ET6-XII	III	1-1.5	?	Early Child	Middle Status	?	?	?	?	0	?	0	?	?			0
ET6-XIII	III	peri-natal	?	Infant	Middle Status	?	?	?	?	?	?	?	?	?			0
CF 1	IV-1	peri-natal	?	Infant	Sacrifice? (military dwelling)	?	?	?	?	0	?	?	?	?			0
CF 2-1	IV-1	25-35	M	Young Male	High Status (military dwelling)	1	?	0	?	0	0	1	?	0	L ulna (D1/3, AM)	I	1

CF 2-2	IV-1	25-35	M	Young Male	High Status (military dwelling)	0	?	?	?	0	0	0	?	?			0
CF 2-3	IV-1	6-8	?	Late Child	High Status (military dwelling)	0	?	?	?	0	0	0	?	?			0
CF 2-4	IV-1	1.5-3	?	Early Child	High Status (military dwelling)	0	?	0	?	0	0	0	0	0			0
CF 2-5	IV-1	25-40	F	Young Female	High Status (military dwelling)	?	?	?	?	0	0	?	?	?			0
CF 2-6	IV-1	20-30	F	Young Female	High Status (military dwelling)	?	?	?	?	?	?	?	?	?			0
CF 3-I	IV-1	35-45	F	Middle Adult Female	High Status (military dwelling)	0	?	0	0	0	0	0	?	?			0
CF 3-II	IV-1	25-30	M	Young Male	High Status (military dwelling)	1	?	0	?	1	0	0	0	0	Occipital (base, 32 x 5 mm aprx, S-BFT, PM)	IV	1
CF 3-III	IV-1	3-5	?	Early Child	High Status (military dwelling)	0	?	?	?	0	0	0	0	0			0
CF 3-IV	IV-1	2-3	?	Early Child	High Status (military dwelling)	?	?	?	?	0	?	?	?	?			0
CF 3-V	IV-1	20-30	M	Young Male	High Status (military dwelling)	0	?	?	?	0	0	0	0	0	Possibly in L 11th rib (neck, AM)		0

CF 3-VI	IV-1	25-35	M	Young Male	High Status (military dwelling)	0	?	?	1	0	0	0	0	?	L 7th? rib (angle, AM) and unknown rib (SE, AM)	II	1
CF 3-IX	IV-1	2-4	?	Early Child	High Status (military dwelling)	?	?	?	?	?	?	0	?	0			0
CF 3-X	IV-1	peri-natal	?	Infant	High Status (military dwelling)	?	?	?	?	0	?	0	?	?			0
CF 4-I	IV-1	20-30	F	Young Female	High Status (military dwelling)	1	?	?	?	1	1	0	?	0	R parietal (sup, 14.7 x 10 mm, AM) and frontal (R, 9 x 5 mm, AM)	III	1
CF 4-II	IV-1	30-40	F	Middle Adult Female	High Status (military dwelling)	0	?	?	?	0	0	0	?	?			0
CF 4-III	IV-1	25-35	F	Young Female	High Status (military dwelling)	0	?	?	?	0	0	0	?	?			0
CF 4-IV	IV-1	30-40	M?	Middle Adult Male	High Status (military dwelling)	1	?	?	?	1	0	?	?	0	L parietal (post-sup, 18.3 x 10.2 mm, AM) and R parietal (post-sup, 7.8 x 5.9 mm, AM)	III	1
CF 4-V	IV-1	16-22	M	Young Male	High Status (military dwelling)	?	?	?	?	?	?	0	?	?			0
CF 4-VI	IV-1	25-45	F?	Middle Adult Female	High Status (military dwelling)	0	?	?	?	0	0	0	?	?			0
ET 20B N1	IV-1	1.5-2.5	?	Early Child	High Status (military dwelling)	0	?	?	?	0	0	0	?	?			0

CF 5-1	IV-1	25-35	F	Young Female	High Status (military dwelling)	0	1	0	?	0	0	0	0	0	5th MP of the L? foot (DE, AM)	I	1
CF 5-2	IV-1	4-6	?	Early Child	High Status (military dwelling)	0	0	?	0	0	0	0	0	0			0
CF 6-III	IV-1	50+	F	Old Female	High Status (military dwelling)	0	?	0	1	0	0	0	0	?	R 4th & 5th; and L 3rd to 6th ribs (SE, AM)	III	2
CF 6-IV	IV-1	1-2	?	Early Child	High Status (military dwelling)	?	?	0	?	0	?	?	?	?			0
CF 6-V	IV-1	peri-natal	?	Infant	High Status (military dwelling)	?	?	?	0	0	?	0	0	?			0
CF 6-VI	IV-1	1.5-2.5	?	Early Child	High Status (military dwelling)	0	?	0	0	0	0	0	?	0			0
CF 8	IV-1	25-45	F	Middle Adult Female	High Status (military dwelling)	1	?	0	?	0	1	0	0	?	Frontal (L, 3 x 3 mm, AM)	II	1
CF 9-1	IV-1	35-45	F	Middle Adult Female	High Status (military dwelling)	1	?	0	1	0	1	0	0	?	L nasal (AM); R 6th-9th ribs (angles, AM); R 10-11th and L 11th ribs (bodies, AM). Possibly in 3rd MP of the L? hand (DE, AM)	III	1
CF 10-1	IV-1	20-30	M	Young Male	High Status (military dwelling)	0	?	0	?	0	0	0	?	?			0
CF 10-2	IV-1	20-30	F	Young Female	High Status (military dwelling)	1	?	?	?	1	0	0	?	?	R parietal (post-sup, 29 x 16 mm, BFT?, PM). Possible AM Fx in tooth	IV	1

															23.		
CF 10-3	IV-1	7.5-12.5	?	Late Child	High Status (military dwelling)	0	?	?	?	0	0	0	0	?			0
CF 10-4	IV-1	2-3	?	Early Child	High Status (military dwelling)	?	?	?	?	0	0	?	?	0			0
CF 10-5	IV-1	1-2	?	Early Child	High Status (military dwelling)	?	?	?	?	0	0	?	?	?			0
CF 11	IV-1	1-2	?	Early Child	Sacrifice? (military dwelling)	?	?	?	?	0	0	?	?	?			0
EA 41	IV-2	50+	F	Old Female	High Status (military dwelling)	?	0	0	?	0	?	?	0	?			0
ET 70-I	IV-2	16-19	F	Adolescent	High Status (military dwelling)	0	?	?	?	0	0	0	0	0			0
ET 70-II	IV-2	1-2	?	Early Child	High Status (military dwelling)	0	?	?	?	0	0	0	0	0			0
ET 70-III	IV-2	3-4	?	Early Child	High Status (military dwelling)	0	?	0	0	0	0	0	0	0			0
ET 87A-I	IV-2	12-17	?	Adolescent	High Status (military dwelling)	0	?	0	?	0	0	0	0	0			0
ET 87A-	IV-2	17-19	M	Young Male	High Status (military	0	?	?	?	0	0	0	?	0			0

II					dwelling)												
ET 87A-III	IV-2	17-23	M	Young Male	High Status (military dwelling)	0	?	?	?	0	0	0	?	0			0
ET 87A-IV	IV-2	3-4	?	Early Child	High Status (military dwelling)	0	?	?	?	0	0	0	?	?			0
ET 87A-V	IV-2	5-7	?	Late Child	High Status (military dwelling)	0	?	0	1	0	0	0	0	0	One L rib (SE, AM). Could belong to ET 87A-VI.	II	1
ET 87A-VI	IV-2	7.5-12.5	?	Late Child	High Status (military dwelling)	?	?	0	?	?	?	0	0	0			0
ET 87A-VII	IV-2	25-35	F	Young Female	High Status (military dwelling)	1	?	?	?	0	1	0	?	0	Frontal (R, 9 x 6 mm, AM)	II	1
ET 87A-VIII	IV-2	25-35	F	Young Female	High Status (military dwelling)	0	?	0	?	0	0	0	?	0			0
ET 87A-IX	IV-2	20-30	M	Young Male	High Status (military dwelling)	1	?	?	?	0	1	0	?	?	Frontal (L supraorbital ridge, 11 x 8 mm, AM). Two possible AM fractures in the frontal (L, 4.5 x 3 mm; and central, 34 x 24.5 mm)	III	1
ET 87A-X	IV-2	3-4	?	Early Child	High Status (military dwelling)	0	?	?	?	0	0	0	?	0			0
ET 87A-XI	IV-2	3-4	?	Early Child	High Status (military dwelling)	0	?	?	?	0	0	0	?	0			0

ET 87A-XII	IV-2	1-2	?	Early Child	High Status (military dwelling)	0	?	?	?	0	0	0	0	0			0
ET 87A-XIII	IV-2	30-45	M	Middle Adult Male	High Status (military dwelling)	1	?	0	1	1	0	0	0	0	Frontal (R-sup, 26.3 x 13.3 mm, BFT, PM); L 3rd rib (S1/3, AM)	IV	2
ET 87A-XIV	IV-2	25-35	F	Young Female	High Status (military dwelling)	0	?	?	?	0	0	0	?	0			0
ET 87A-XV	IV-2	3-4	?	Early Child	High Status (military dwelling)	1	?	?	?	1	0	0	?	0	R parietal (sup, 10 x 7 mm aprx, AM)	III	1
ET 87A-XVI	IV-2	1-2	?	Early Child	High Status (military dwelling)	?	?	?	?	0	?	?	?	0			0
ET 87A-XVII	IV-2	0.5-1.5	?	Early Child	High Status (military dwelling)	0	?	?	?	0	0	0	?	0			0
ET 87A-XVIII	IV-2	0.5-1	?	Infant	High Status (military dwelling)	?	?	?	?	?	?	0	?	0			0
ET 87A-XIX	IV-2	3-9 m	?	Infant	High Status (military dwelling)	?	?	?	?	?	?	0	?	?			0
ET 87A-XX	IV-2	3-9 m	?	Infant	High Status (military dwelling)	?	?	?	?	?	0	?	?	0			0
ET 87A-XXI	IV-2	peri-natal	?	Infant	High Status (military dwelling)	?	?	?	?	?	?	0	?	?			0

ET 87B-XXII	IV-2	4-6	?	Early Child	High Status (military dwelling)	0	?	0	?	0	0	0	0	?			0
ET 87B-XXIII	IV-2	30-40	M	Middle Adult Male	High Status (military dwelling)	1	?	?	?	1	0	0	?	?	L parietal (post, 7.3 x 7 mm, AM)	II	1

Appendix X: Summary Data for Puruchuco-Huaquerones

Code	Sector	Age	Sex	Cohort	Social Group	Mal-intent	Acci-dental	Occupa-tional	Un-known	Vault	Face	Parry FX	Boxer's Fx	Teeth	Brief description	Lethality	MNEv
T 018	57AS03	50+	F	Old Female	Middle Status (weaver)	?	?	?	?	?	?	?	?	?			0
T 029A	57AS03	30-45	M	Middle Adult Male	Middle Status (weaver)	?	?	?	?	?	?	?	?	?			0
T 031A	57AS03	35-50	M	Middle Adult Male	Middle Status	?	?	?	?	?	?	?	?	?			0
T 033	57AS03	19-30	M	Young Male	Middle Status (musician)	?	?	?	?	?	?	?	?	?			0
T 047	57AS03	35-50	F	Middle Adult Female	Middle Status (weaver)	?	?	?	?	?	?	?	?	?			0
T 048	57AS03	15-20	F	Adolescent	Low Status (atypical)	1	0	0	0	1	1	0	0	1	L parietal (sup-ant, BFT, PM), with radial and concentric fractures affecting the left side of the skull (frontal, parietal, temporal, and occipital bones); R mandible and maxilla (BFT, PM); tooth 27 (bucal, PM)	V	1
T 059	57AS03	35-45	M?	Middle Adult Male	Middle Status	?	?	?	?	?	?	?	?	?			0

T 061	57AS03	13-15	?	Adolescent	Middle Status	0	0	0	0	0	0	0	0	?			0
T 063	57AS03	40-50	F	Middle Adult Female	Middle Status (weaver)	?	?	?	?	?	?	?	?	?			0
T 068	57AS03	2-3	?	Early Child	Low Status	0	0	0	0	0	0	0	0	?			0
T 073	57AS03	20-30	M	Young Male	Low Status (atypical)	1	1	1	1	1	1	?	0	?	PM BFT to the occipital (with radial and concentric fractures affecting other bones of the skull), left side of the face (orbit, nasal, zygomatic, sphenoid, and maxilla), sternum (body), both scapulae (bodies), L 2nd-10th ribs (bodies, S1/3, and SE), and R os coxae (iliopubic ramus). L5 (spondylolysis, AM)	V	2
T 075	57AS03	1-2	?	Early Child	Middle Status	0	0	0	0	0	0	0	0	?			0
T 076A	57AS03	7-11	?	Late Child	Low Status (weaver?)	1	0	0	0	1	0	0	0	?	Frontal (L, AM)	II	1
T 078	57AS03	15	F	Adolescent	Middle Status (weaver) (atypical)	0	0	0	0	0	0	0	0	?			0
T 081	57AS03	20-35	M	Young Male	Middle Status (soldier, musician)	0	0	0	0	0	0	0	0	?	Possible PM Fx in the L tibia		0
T 084	57AS03	35-45	M	Middle Adult Male	Middle Status (soldier, weaver)	?	0	0	0	?	0	0	0	?			0

T 097	57AS03	17- 19	M	Young Male	Low Status (atypical)	0	0	0	1	0	0	0	0	0	L 6th-12th ribs (head to S1/3, BFT, PM) and R 3rd-5th ribs (head to SE, BFT, PM)	IV	1
T 100	57AS03	peri-natal	?	Infant	Middle Status	0	?	?	0	0	0	0	?	?			0
T 104	57AS03	20-23	M	Young Male	Low Status	0	0	0	0	0	0	0	0	?			0
T 105	57AS03	20-30	M	Young Male	Middle Status	?	?	?	?	?	?	?	?	?			0
T 107	57AS03	30-40	F	Young Female	Middle Status (weaver)	1	1	0	0	0	1	0	?	?	Multiple PM injuries to the frontal and mandible; T6 (spinous process, PM)	V	1
T 117	57AS03	50+	F	Old Female	Low Status (atypical)	0	0	0	0	0	0	0	0	?			0
T 118	57AS03	15-20	F?	Adolescent	Low Status (weaver) (atypical)	?	0	0	0	?	?	0	0	?			0
T 119A	57AS03	30-45	F	Middle Adult Female	Low Status?	1	?	?	1	0	1	0	?	?	PM BFT to the R zygomatic- R maxilla, sternum (body), R 8th rib (angle), and L 2nd-8th ribs (SE-S1/3). Possible PM Fx on teeth 13-18.	V	1
T 120	57AS03	35-45	M	Middle Adult Male	Middle Status (soldier)	0	0	0	0	0	0	0	0	?			0

T 121	57AS03	30- 40	M	Middle Adult Male	Low Status (soldier)	1	1	0	1	1	1	0	?	?	Multiple PM BFT to the skull, affecting R zygomatic-zygomatic process; L zygomatic process-zygomatic-maxilla; frontal (L supraorbital ridge, 13 mm); L parietal (sup-ant, 9.76 x 8.94 mm; lateral, 31.5 x 25 mm; lat-ant, 15.56 x 14.25 mm; and lat-post, 18.44 x 10.21 mm); occipital (central) and vault base (occipital and sphenoid). PM SFT to the occiptal (L, 9.7 x 5.87 mm); PM FX in the L 8th and 9th ribs (angles). AM Fx in the L nasal, R parietal (post, 12 x 8 mm), R ulna (P1/3 - Monteggia Fx), and L 2nd rib (SE).	V	2
T 123	57AS03	20-35	M	Young Male	Low Status (atypical)	1	?	?	?	1	?	?	?	?	PM GSW to the L parietal (sup)	IV	1
T 124	57AS03	30-50	M	Middle Adult Male	Low Status (weaver?) (atypical)	0	?	?	?	0	0	0	0	?			0
T 125	57AS03	50+	F	Old Female	Middle Status (weaver)	?	?	?	?	?	?	?	?	?			0
T 136A	57AS03	peri-natal	?	Infant	unknown	0	0	0	0	0	0	0	0	?			0
T 138	57AS03	2-4	?	Early Child	Middle Status?	0	?	?	0	0	0	0	?	?			0
T 139	57AS03	35- 50	F	Middle Adult	Low Status (weaver?)	0	?	?	?	0	0	0	?	?			0

				Female	(atypical)												
T 142	57AS03	30-45	M	Middle Adult Male	Middle Status	0	0	0	0	0	0	0	0	?			0
T 145	57AS03	14- 16	F	Adolescent	Low Status (atypical)	1	1	0	0	1	0	0	0	0	Two PM BFT to the occipital (R sup-central and base, 45.42 mm); R 3rd metacarpal (shaft, AM); PP of the foot (D1/3, AM).	V	3
T 146	57AS03	20- 30	F	Young Female	Low Status (atypical)	?	0	?	?	?	?	0	0	?			0
T 149	57AS03	50+	F	Old Female	Low Status	?	?	?	?	?	?	?	?	?			0
T 151	57AS03	20-23	M	Young Male	Low Status (atypical)	1	?	1	?	1	1	?	?	?	GSW to the occipital (L, 15.04 x 9.53 mm, PM); PM BFT to the occipital (R, 28.33) and R parietal (post, 37.97 mm); PM lesion (SFT) to the mandible (L ramus, 7.37 x 5.60 x 5.60 mm); L6 (spondylolysis, AM); possibly in L parietal (AM)	V	2
T 152	57AS03	15- 20	M?	Young Male	Low Status (atypical)	?	?	?	?	0	?	?	?	?			0
T 154B	57AS03	6-9	?	Late Child	Middle Status	0	0	0	1	0	0	0	0	?	R 11th rib (body, AM)	II	1
T 155	57AS03	15-19	M?	Adolescent	Low Status (atypical)	0	0	0	0	0	0	0	0	?			0

T 160	57AS03	30- 40	M	Middle Adult Male	Low Status (soldier)	1	1	1	1	1	1	0	0	?	R zygomatic (BFT, PM); L temporal (mastoid process-petrous pyramid, BFT, PM); R scapula (body-acromion, BFT, PM); R 5th rib (S1/3, BFT, PM); L 4th-5th metacarpals (PE, SFT?, PM) ; L5 (spondylolysis, AM). Probably in R radius (PM).	V	2
T 163	57AS03	2-4	?	Early Child	Low Status (weaver?)	0	0	0	0	0	0	0	0	?			0
T 164	57AS03	35-50	F	Middle Adult Female	Low Status (atypical)	0	?	?	1	0	0	0	?	0	R 1st-7th ribs (bodies, PM) and R 1st-9th ribs (necks-angles, BFT, PM); L scapula (body-acromion, BFT, PM) ; probable in sternum (manubrium, BFT, PM). Possible AM Fx in C7 (NA)	IV	1
T 175	57AS03	30-45	M	Middle Adult Male	Low Status (soldier) (atypical)	0	?	0	0	0	0	0	0	?	Possible PM lesions in maxillae, mandible, L 9th rib (body), sternum, and pelvis		0

T 176	57AS03	35- 45	F	Middle Adult Female	Middle Status (weaver) (atypical)	1	1	1	1	1	0	0	1	0	Parietals (post, 58.78 x 51.76 mm, BFT, PM) and at least another lesion, producing extensive damage to the skull; R 4th metacarpal (shaft, AM); T11 (body, PM); R radius (PE, PM); L ulna and radius (D1/3, AM); L4 (spondylolysis, AM); both 9th ribs (angles, AM), L 9th rib (body, AM). Probable PM Fx in occipital (base, BFT), R side of the face, both ossa coxae (iliopubic and ischiopubic rami), and R 3rd rib (angle).	V	2
T 178	57AS03	25-40	M	Young Male	Middle Status (atypical)	0	0	0	0	0	0	0	0	?			0
T 184	57AS03	17- 25	M?	Young Male	Low Status (atypical)	0	?	0	?	0	0	0	?	?			0
T 185	57AS03	35- 45	M	Middle Adult Male	Low Status (soldier) (atypical)	1	0	0	1	1	0	0	0	0	PM BFT to the left side of the skull (parietal, occipital, temporal); L 9th-11th ribs (bodies, PM) and L 8th rib (S1/3, PM). Possible PM Fx in R 5th rib (body).	V	1
T 189	57AS03	30-40	M	Middle Adult Male	Low Status	0	1	0	1	0	0	0	0	?	R scapula (acromion and infra-glenoid tubercle, PM); R 5th rib (body, PM); and R 10th rib (angle, PM)	IV	1
T 190	57AS03	35-50	M?	Middle	Middle Status	?	?	?	?	?	?	?	?	?			0

				Adult Male													
T 193	57AS03	25-35	M	Young Male	Low Status (atypical)	0	0	0	0	0	0	0	0	?			0
T 209	57AS03	35-45	M	Middle Adult Male	Middle Status	?	?	?	?	?	?	?	?	?			0
T 216	57AS03	2-3	?	Early Child	Low Status	0	0	0	0	0	0	0	0	?			0
T 218	57AS03	20-30	M	Young Male	Low Status (atypical)	1	0	0	0	1	0	0	0	0	Occipital (nuchal crest, BFT, PM)	IV	1
T 222	57AS03	50+	M	Old Male	Low Status	?	?	?	?	?	?	?	?	?			0
T 228	57AS03	35-45	F	Middle Adult Female	Middle Status (weaver)	?	?	?	?	?	?	?	?	?			0
T 230	57AS03	40-60	F	Middle Adult Female	Middle Status (weaver)	?	0	0	0	0	0	?	0	?			0
T 231	57AS03	15- 17	F	Adolescent	Low Status (atypical)	1	0	0	0	1	1	0	0	1	Frontal (L, 23.33 x 18.05 mm, S-BFT, PM); frontal (L supraorbital margin, 19 x 11.5 mm, BFT, PM); L nasal-maxilla, BFT, PM); L zygomatic-maxilla-sphenoid (BFT, PM); occipital (base, 12.65 x 9.18 mm, BFT, PM); R parietal (post, 17.54 mm, BFT, PM); mandible (L side of the body, BFT, PM). PM Fx of teeth 11-13, 21-23, and 27.	V	1

T 241	57AS03	15- 25	F	Young Female	Middle Status (weaver)	?	?	0	?	0	0	?	?	?	Possibly in L femur (P1/3, BFT, PM) and R femur (head and D1/3, BFT, PM)		0
T 248	57AS03	15-20	M	Young Male	Middle Status (atypical)	1	1	?	1	1	?	?	?	?	PM Fx in the L parietal (x 2) and occipital (quadrangular defects), L 1st rib, L 3rd-4th metacarpals (SFT), and R proximal tibia	V	1
T 260	57AS03	12-14	?	Adolescent	Middle Status	1	0	0	0	1	0	0	0	?	Occipital (BFT, PM); and possible perimortem BFT in the R zygomatic	IV	1
T 261	57AS03	2-4	?	Early Child	Low Status	0	1	0	1	0	0	0	0	?	L fibula (AM); R 10th-11th ribs (SE, AM). Long bone with sclerotic periostosis. Possibly PM Fx of T5 (left transverse process)	II	2
T 262	57AS03	3-4	?	Early Child	Low Status	0	?	?	0	0	0	0	0	?			0
T 264	57AS03	2-3	?	Early Child	Low Status	?	?	?	0	0	0	?	?	?			0
T 269	57AS03	15- 20	M?	Adolescent	Middle Status (soldier, weaver)	0	1	0	0	0	0	0	0	?	L clavicle (acromial end, BFT,PM)	IV	1
T 274	57AS03	25-35	M	Young Male	Low Status (soldier) (atypical)	?	?	?	?	?	?	?	?	?			0
T 275	57AS03	35-45	M	Middle Adult Male	Low Status (soldier) (atypical)	0	0	0	0	0	0	0	0	?	Possibly in R 2nd rib (PM)		0

T 279	57AS03	25-35	M?	Young Male	Middle Status	?	?	?	?	?	?	?	?	?			0
T 283	57AS03	35-45	M	Middle Adult Male	Middle Status	?	?	?	?	?	?	?	?	?			0
T 286	57AS03	3-5	?	Early Child	Low Status	0	?	?	0	0	0	0	?	?			0
T 287	57AS03	25-40	F	Young Female	Middle Status	?	?	?	?	?	?	?	?	?			0
T 292	57AS03	0.5-1.5	?	Infant	Low Status	0	0	0	0	0	0	0	0	?			0
T 296	57AS03	35-50	M	Middle Adult Male	Middle Status	?	?	?	?	?	?	?	?	?			0
T 297	57AS03	50+	F	Old Female	Low Status (weaver?)	?	?	?	?	?	?	?	?	?			0
T 298	57AS03	50+	F	Old Female	Middle Status (weaver)	?	?	?	?	?	?	?	?	?			0
T 308	57AS03	14-19	F	Adolescent	Middle Status (atypical)	0	0	0	0	0	0	0	0	?			0
T 310	57AS03	15- 18	M	Adolescent	Low Status (soldier)	1	0	0	0	1	0	0	0	0	Occipital (sup, 18.77 x 9.78 mm, BFT, PM)	IV	1
T 312	57AS03	16-19	F	Young Female	High Status (weaver)	?	?	?	?	?	?	?	?	?			0
T 314	57AS03	15-19	M	Adolescent	Low Status (atypical)	?	?	0	0	0	0	?	?	?			0
T 324	57AS03	30-45	F	Middle Adult Female	Middle Status (weaver)	?	?	?	?	?	?	?	?	?			0

T 325	57AS03	30-40	M	Middle Adult Male	Middle Status	?	?	?	?	?	?	?	?	?			0
T 326	57AS03	20-35	F	Young Female	Low Status (atypical)	0	0	0	0	0	0	0	0	?			0
T 332	57AS03	13-20	?	Adolescent	Middle Status (soldier)	1	?	0	1	0	0	1	0	?	L ulna (D1/3, AM); L 2nd rib (S1/3, AM)	II	2
T 333	57AS03	35-60	F	Middle Adult Female	Low Status (weaver)	?	?	?	?	?	?	?	?	?			0
T 352	57AS03	25-40	M	Middle Adult Male	Low Status?	?	?	?	?	?	?	?	?	?			0
T 354A	57AS03	3-7	?	Early Child	Low Status	0	0	0	0	0	0	0	0	?			0
T 355	57AS03	25-50	F	Middle Adult Female	Middle Status (weaver)	?	?	?	?	?	?	?	?	?			0
T 357	57AS03	35-50	M	Middle Adult Male	Low Status	?	?	?	?	?	?	?	?	?			0
T 359	57AS03	1.5-2.5	?	Early Child	Low Status	0	?	?	0	0	0	0	?	?			0
T 363	57AS03	2-4	?	Early Child	Low Status	0	0	0	0	0	0	0	0	?			0
T 366	57AS03	40-60	F	Middle Adult Female	Middle Status (weaver)	0	?	?	?	0	0	0	0	?	Possible PM Fx in the L temporal and parietal		0

T 368	57AS03	35-45	M	Middle Adult Male	Low Status (soldier) (atypical)	1	1	0	1	0	1	0	0	1	Frontal (R supraorbital margin, BFT, PM); R zygomatic-zygomatic process (BFT, PM); L orbit-zygomatic-zygomatic process, BFT, PM); mandible (L ramus, BFT, PM); teeth 11-13 and 21-23; atlas (L sup articular facet, PM); L 2nd and 5th-8th ribs (S1/3, BFT, PM); L 3rd-4th ribs (SE, AM). Possibly in manubrium (PM)	V	2
T 377	57AS03	25-30	M	Young Male	Middle Status (soldier)	?	?	?	?	?	?	?	?	?			0
T 392	57AS03	35-50	F?	Middle Adult Female	Middle Status (weaver)	?	?	?	?	?	?	?	?	?			0
T 393	57AS03	peri-natal	?	Infant	Low Status	0	0	0	0	0	0	0	0	?			0
T 404A	57AS03	35-45	F?	Middle Adult Female	Low Status	?	?	?	?	?	?	?	?	?			0
T 404B	57AS03	35-50	F	Middle Adult Female	Low Status	?	?	?	?	?	?	?	?	?			0
T 405	57AS03	4-8	?	Late Child	Low Status	0	0	0	0	0	0	0	0	?			0
T 408A	57AS03	35-50	M	Middle Adult Male	Middle Status (weaver?)	?	?	?	?	?	?	?	?	?			0
T 410	57AS03	50+	F	Old Female	Low Status?	?	?	?	?	?	?	?	?	?			0

T 411A	57AS03		?	Adolescent	Low Status?	?	?	0	?	0	0	?	?	?			0
T 421	57AS03	peri-natal	?	Infant	Middle Status	0	0	0	0	0	0	0	0	?			0
T 427	57AS03	50+	F	Old Female	Middle Status?	?	?	?	?	?	?	?	?	?			0
T 429	57AS03	35-45	M	Middle Adult Male	Middle Status	?	?	?	?	?	?	?	?	?			0
T 432	57AS03	17-23	M	Young Male	Middle Status (soldier, weaver)	?	?	?	?	?	?	?	?	?			0
T 433	57AS03	25-40	M?	Middle Adult Male	Middle Status (soldier) (atypical)	?	?	?	?	?	?	?	?	?			0
T 436	57AS03	12-18	?	Adolescent	Low Status	?	?	?	0	?	0	0	?	?			0
T 438	57AS03	35-50	M	Middle Adult Male	Middle Status (weaver?)	?	?	?	?	?	?	?	?	?			0
T 442	57AS03	50+	F	Old Female	Middle Status (weaver)	?	?	?	?	?	?	?	?	?			0
T 450	57AS03	25-35	M	Young Male	Middle Status (soldier? weaver?) (atypical)	0	1	0	1	0	0	0	0	0	PM BFT in the sternum (manubrium and body), L clavicle (acromial end), R 1st-11th and L 1st-9th and 11th ribs (neck, body, and SE)	IV	1

T 459	57AS03	25-35	M	Young Male	Low Status (atypical)	1	0	0	0	1	1	0	0	0	Face (Le Fort and frontal Fx, BFT, PM); occipital (L, 56.53 x 37.42 mm, BFT, PM); R 11th rib (body, AM). Possibly in 1st DP of both hands (DE, AM) and R radius (AM)	V	2
T 467	57AS03	12-18	M?	Adolescent	Middle Status (soldier) (atypical)	?	?	?	?	?	?	?	?	?			0
T 469	57AS03	7-14	?	Late Child	Low Status (atypical)	0	?	0	0	0	0	0	0	?			0
T 471	57AS03	30-45	M	Middle Adult Male	Middle Status (soldier)	?	?	?	?	?	?	?	?	?			0
T 474	57AS03	15- 17	M?	Adolescent	Middle Status (soldier) (atypical)	?	1	0	1	?	?	0	0	?	R scapula (body, BFT?, PM); L 9th-11th ribs (necks and bodies, BFT, PM). Possibly in L scapula (PM), R radius (PM), and 3rd metacarpal (distal shaft, AM)	IV	1
T 477	57AS03	25-50	F	Middle Adult Female	Middle Status (weaver)	?	?	?	?	?	?	?	?	?			0
T 479	57AS03	12-16	M?	Adolescent	Low Status (atypical)	1	?	0	0	1	0	0	?	?	Comminuted fractures on R parietal and occipital (BFT,PM); possibly in R 3rd rib (body, AM)	V	1

Appendix XI: Recording Forms

INVENTARIO DE ESQUELETOS COMPLETOS Y SEMICOMPLETOS

Proyecto:	Nº Entierro:	Registrador:
Sitio:	Nº Esqueleto:	Fecha:
Sector:	Caja:	Ubicación:

CRÁNEO: Huesos y Articulaciones

	Der.	Izq.
Frontal		
Parietal		
Occipital		
Temporal (escama)		
Temporal (petrosa)		
Esfenoides		
Malar		
Nasal		
Maxilar		
Palatino		
Mandíbula		

VÉRTEBRAS (Individuales)

	Cuerpo	Arco Neural
C1		
C2		
C7		
D1		
D10		
D11		
D12		
L1		
L2		
L3		
L4		
L5		

Código:

✓	Presente
F	Fragmentado
I	Incompleto
/	Ausente

Sexo	
Edad	

VÉRTEBRAS (Agrupadas)

	# Ptes/ # Completos Cuerpos	# Ptes/ # Completos Arcos Neurales
C3-C6	/	/
D2-D9	/	/

OTROS

Esternón: Manubrio:	Cuerpo:
Apófisis xifoides:	
Hiodes: Cuerpo:	Ramas:

HUESOS Y ARTICULACIONES POST-CRANEALES

	Der.	Izq.
Clavícula		
Omóplato - Cuerpo		
Cavidad Glenoidea		
Rótula		
Sacro		
Coxis		
Coxales		
Ilion		
Isquion		
Pubis		
Acetábulo		
Superficie Auricular		

HUESOS LARGOS

	Epífisis Proximal	Diáfisis: Tercio Proximal	Diáfisis: Tercio Medio	Diáfisis: Tercio Distal	Epífisis Distal
Húmero derecho					
Húmero izquierdo					
Cúbito derecho					
Cúbito izquierdo					
Radio derecho					
Radio izquierdo					
Fémur derecho					
Fémur izquierdo					
Tibia derecha					
Tibia izquierda					
Peroné derecho					
Peroné izquierdo					

COSTILLAS (Individuales)

	Der.	Izq.
1ª		
2ª		
11ª		
12ª		

Agrupadas:	# Presentes / # Completas		
	Der.	Izq.	?
3-10	/	/	/

Fragmentos N.I.: ____________

HUESOS DE LA MANO (# Presentes/ # Completos)	Der.	Izq.	?
Carpos	/	/	/
Metacarpos	/	/	/
Falanges	/	/	/

HUESOS DEL PIE (# Presentes/ # Completos)	Der.	Izq.	?
Astrágalo			
Calcáneo			
Tarsos	/	/	/
Metatarsos	/	/	/
Falanges	/	/	/
Sesamoideos	/	/	/

Estado de conservación:	
Efectos tafonómicos:	
Pelo (color, largo, peinado):	
Tejido blando:	
Insectos:	
Reconstrucción craneal:	
Otras reconstrucciones:	
Muestras/Otros análisis:	
Restos de otro(s) individuo(s):	
Observaciones:	

Modificado de Centro Mallqui

FICHA DE DETALLES ANTROPOLÓGICOS - ADULTOS

Proyecto:	Nº Entierro:	Registrador:
Sitio:	Nº Esqueleto:	Fecha:
Sector:	Caja:	Ubicación:

I. SEXO

Pelvis	I	D
Arco ventral (1-3)		
Concavidad subpúbica (1-3)		
Rama isquio-púbica (1-3)		
Escotad. ciática mayor (1-5)		
Surco pre-auricular (0-4)		
Sexo estimado en la pelvis		

(Buikstra y Ubelaker 1994)

Cráneo	I	M	D
Cresta nucal (1-5)			
Proceso mastoideo (1-5)			
Margen supra-orbital (1-5)			
Glabela (1-5)			
Eminencia mentoniana (1-5)			
Sexo estimado en el cráneo			

(Buikstra y Ubelaker 1994)

Comentarios:

SEXO ESTIMADO:

Modificado de Centro Mallqui

II. EDAD

	Lado/Nº	Fase	Rango	Media
a. Sínfisis púbica (Suchey-Brooks 1990)				
b. Borde esternal (Işcan et al.1984-1985)				
c. Superficie auricular (Lovejoy et al. 1985)				

d. Dientes uniradiculares (Lamendin et al. 1992)

Diente	Vestibular				Lingual			
	Raíz	Periodont.	Transp.	Edad	Raíz	Periodont.	Transp.	Edad

e. Otra técnica (especificar):

f. Centros secundarios de osificación (Mc Kern y Stewart 1957)

Elemento	Abierta	Parcial	Cerrada	N.O.
Clavícula derecha	<21	<29	>22	?
Clavícula izquierda	<21	<29	>22	?
S1-S2 (central)	<17	<33	>17	?
Cresta iliaca derecha	<16	<23	>17	?
Cresta iliaca izquierda	<16	<23	>17	?
Anillos vertebrales	<21	16-29	>24	?

Rango estimado: ______________

EDAD ESTIMADA:

Proyecto:	Nº Entierro:	Registrador:
Sitio:	Nº Esqueleto:	Fecha:
Sector:	Caja:	Ubicación:

III. ESTATURA

Elemento/Lado	Longitud (cm)	Rango	Media
Fémur izquierdo	______	______	______
Fémur derecho	______	______	______
Tibia izquierdo	______	______	______
Tibia derecha	______	______	______

ESTATURA ESTIMADA: (Genovés 1967) ______ ______

(Para el rango considerar los valores mínimo y máximo y en la media el promedio de todas ellas)

IV. OBSERVACIONES Y MEDICIONES COMPLEMENTARIAS

Diámetro vertical de la cabeza del húmero izquierdo:
Diámetro vertical de la cabeza del húmero derecho:
Longitud máxima de húmero izquierdo:
Longitud máxima de húmero derecho:
Diámetro máximo de la cabeza del fémur izquierdo:
Diámetro máximo de la cabeza del fémur derecho:

FUSIÓN DE ELEMENTOS ÓSEOS (ADOLESCENTES)

(en base a Scheuer y Black, 2000)

Caso:

Registrador:

Fecha:

Edad estimada:

			Hombres	Mujeres	Edad estimada
Cabeza	Occipital	Sincondrosis esfeno-occipital	13-18	11-16	
Tórax	Costillas	Cabezas	17-25		
		Esternebras 3 y 4	4-10		
		Esternebra 2 con 3-4	11-16		
		Esternebra 1 con mesoesternón	15-20		
	Esternón	Completo	21 (con líneas de fusión hasta los 25)		
Hombro		Coracoides-Subcoracoides-Cuerpo	Inicio: 13-16 Fin: 15-17		
		Epífisis acromial y coracoides	Fin: aprox. 20		
	Omóplato	Borde del ángulo inferior y borde medial	Fin: aprox. 23		
		Epífisis lateral	19-20		
	Clavícula	Epífisis medial	Inicio:16-21 Fin: 29+		
	Húmero	Epífisis proximal	16-20	13-17	
Codo	Húmero	Epicóndilo medial	14-16	13-15	
	Radio	Epífisis proximal	14-17	11.5-13	
	Cúbito	Epífisis proximal	13-16	12-14	
Mu-ñeca	Radio	Epífisis distal	16-20	14-17	
	Cúbito	Epífisis distal	17-20	15-17	
Mano	Falangetas	Epífisis	16	13.5	
	1er metacarpo	Base	16.5	14-14.5	
	Falanges y falanginas	Epífisis	16.6	14-14.6	
	Metacarpos 2-5	Cabezas	16.5	14.5-15	
Cadera		Rama isquipúbica	5-8		
		Acetábulo	14-17	11-15	
			Inicio: 17-20 Fin: 20-23		
		Cresta iliaca	Parcial: 15-22		
		Espina iliaca anterior inferior	aprox. 20		
	Coxal	Epífisis isquial	Fin: 20-23		
		Cabeza	14-19	12-16	
		Trocánter mayor	16-18	14-16	
	Fémur	Trocánter menor	16-17		
Rodilla	Fémur	Epífisis distal	16-20	14-18	
	Tibia	Epífisis proximal	15-19	13-17	
	Peroné	Epífisis proximal	15-20	12-17	
Tobillo	Tibia	Epífisis distal	15-18	14-16	
	Peroné	Epífisis distal	15-18	12-15	
	Astrágalo	Epífisis	12	9	
Pie	5to metatarso	Base	12-14	9-11	
	Falanginas y falangetas	Epífisis	14-16	11-13	
	Metatarsos 2-5	Cabezas	14-16	11-13	
	Falages	Epífisis	16-18	13-15	
	1er metatarso	Base	16-18	13-15	
	Calcáneo		Inicio: 11-14 Fin: 18-20	Inicio: 10-12 Fin: 15-16	

Proyecto:	Nº Entierro:	Registrador:
Sitio:	Nº Esqueleto:	Fecha:
Sector:	Caja:	Ubicación:

FICHA DE ESTIMACIÓN DE EDAD - SUBADULTOS

I. DESARROLLO DENTAL

1. Smith, 1991

Diente	Fase	Estimación de edad
Edad estimada:		

2. Ubelaker, 1989:

3. Gaither, 2004:

4. Otros (especificar):

EDAD DENTAL ESTIMADA:

II. MEDICIONES

FETOS/PERINATALES

1. Regresiones a partir de la longitud de los huesos largos:

(Fazekas y Kósa, 1978)

	Der.	Izq.	Regresión	Der.	Izq.
Húmero	________	________	Long. (cm) x 7.52 + 2.47 =	________	________
Radio	________	________	Long. (cm) x 10.61- 2.11 =	________	________
Cúbito	________	________	Long. (cm) x 8.20 + 2.38 =	________	________
Fémur	________	________	Long. (cm) x 6.44 + 4.51 =	________	________
Tibia	________	________	Long. (cm) x 7.24 + 4.90 =	________	________
Peroné	________	________	Long. (cm) x 7.59 + 4.68 =	________	________

(9.5 = 3m; 12.3 = 3.5m; 17.3 = 4m; 22 = 4.5m; 25.6 = 5m; 27.3 = 5.5m; 30.6 = 6m; 32.6 = 6.5m; 35.4 = 7m; 37.5 = 7.5m; 40= 8m; 42.4 = 8.5m; 45.6 = 9m; 48 = 9.5m; 51.5 = 10m). m = meses lunares.

SUBADULTOS EN GENERAL

2. Longitud máxima de huesos largos y ancho máximo del ilion

	Der.	Izq.	**Gaither, 2004**	**Vega, 2009**	**Otros (especificar)**
Húmero	________	________	________	________	________
Radio	________	________	________	________	________
Cúbito	________	________	________	________	________
Fémur	________	________	________	________	________
Tibia	________	________	________	________	________
Peroné	________	________	________	________	________
Ilion	________	________	________	________	________

EDAD ESTIMADA SEGÚN MEDIDAS:

Proyecto:	Nº Entierro:	Registrador:
Sitio:	Nº Esqueleto:	Fecha:
Sector:	Caja:	Ubicación:

III. OSIFICACIÓN Y FUSIÓN DE ELEMENTOS ÓSEOS

Scheuer y Black, 2000

CRÁNEO

Occipital		Grado de fusión: Abierta	Parcial	Completa
Ap. laterales más largas que la ap. basilar	8 meses en útero			
Apófisis basilar más ancha que larga	6 meses			
Desarrollo de la apófisis yugular	Durante el 1er año			
Apófisis yugulares con condilares (ap. laterales) forman el canal hipogloso	Durante el 1er año			
Sutura mendosa		< 1año	± 1año	> 1año
Ap. laterales con escama		< 3 años	1-3 años	> 1 año
Canal hipogloso completo, excluyendo parte basilar		< 4 años	2-4 años	> 2 años
Ap. basilar con el resto del occipital		< 7 años	5-7 años	> 5 años

Temporal		Abierta	Parcial	Completa
Segmento posterior del anillo con la escama				8 m.e.u.
Dos partes: petro-mastoide y escamo-timpánica	Nacimiento			
Petro-mastoide con escamo-timpánica		< 1año	± 1año	> 1año
Formación del agujero de Huschke y de la ap. mastoidea		< 5 años	1-5 años	> 1 año

Esfenoides		Abierta	Parcial	Completa
Alas menores usualmente fucionadas al cuerpo	5 m en útero			
Partes pre y post esfenoidales del cuerpo				7 m.e.u.
Cuerpo fusionado a alas menores, alas mayores separadas	Nacimiento			
Alas mayores se fusionan al cuerpo y foramen oval completo	Durante el 1er año			
Foramen espinoso completo	Durante el 2º año			

Frontal		Abierta	Parcial	Completa
Fontanela anterior		< 2 años	1-2 años	> 1 año
Sutura metópica		< 4 años	2-4 años	> 2 años

Otros		Abierta	Parcial	Completa
Sínfisis de la mandíbula	Durante el 1er año			
Hioides usualmente osificado	Hacia el 2do año			
Malar con proporcionaes adultas, con apófisis temporal y frontal aserradas, tubérculo marginal y eminencia orbital palpables	2-3 años			
Borde suyperior del nasal aserrado	Hacia el 3er año			

COLUMNA VERTEBRAL

		Abierta	Parcial	Completa
Láminas de dorsales y lumbares			1 año	
Desarrollo del arco anterior del atlas			2 año	
Fusión de la sincondrosis posterior de C3-C7 (completa en la mayoría de L y D)			2 año	
Inicio del desarrollo de las ap. transversas de las lumbares			2 año	

Proyecto:	Nº Entierro:	Registrador:
Sitio:	Nº Esqueleto:	Fecha:
Sector:	Caja:	Ubicación:

COLUMNA VERTEBRAL (continuación)

		Abierta	Parcial	Completa
Foramen transverso completo en todas las cervicales	> 3 años			
Fusión de la sincondrosis posterior y dentoneural del axis		< 4 años	3-4 años	> 3 años
Fusión neurocentral en C3-7 y en dorsales y lumbares		< 4 años	3-4 años	> 3 años
Fusión neurocostal en S1 y S2		< 4 años	3-4 años	> 3 años
Fusión posterior del atlas.		< 5 años	4-5 años	> 4 años
Fusión dento-central del axis		< 6 años	4-6 años	> 4 años
Elementos neurocostales y centros de S1-S2.			> 4 años	
Fusión de láminas de L5		< 5 años	4-5 años	> 4 años
Centros primarios fusionados de la región toráxica y lumbar		< 6 años		> 5 años
Fusión de los centros primarios de todos los segmentos del sacro (excepto sincondrosis posterior)		< 6 años	5-6 años	> 5 años
Fusión del arco anterior del atlas		< 6 años	5-6 años	> 5 años
Fusión de la sincondrosis posterior del sacro			6-10 años	
Fusión del osículo terminal del diente			> 12 años	
Fusión superior e inferior de los elementos costales del sacro			> 12 años	

PELVIS

	Abierta	Parcial	Completa
Fusión de la rama isquiopúbica	< 8 años	5-8 años	> 5 años

MANOS

	Abierta	Parcial	Completa
Fusión de epífisis de falangetas (mujeres)			> 13.5 años
Fusión de epífisis de falangetas (hombres)			> 16 años
Fusión de epífisis de falanges y falanginas, y base de MC 1 (m)			> 14 años
Fusión de cabezas de metacarpos 2 a 5 (mujeres)			> 14.5 años
Fusión de epífisis de falangetas (hombres)			> 16 años
Fusión de epífisis de falanges y falanginas, y base de MC 1 (h)			> 16.5 años
Fusión de cabezas de metacarpos 2 a 5 (hombres)			> 16.5 años

PIES

	Abierta	Parcial	Completa
Fusión de la epífisis del astrágalo (mujeres)			> 9 años
Fusión de la epífisis del calcáneo (mujeres)	< 16 años	10-16	> 10 años
Fusión de las epífisis de las falanginas y falangetas y de las cabezas de los metatarsos 2-5 (mujeres)	< 13 años	11-13 años	> 11 años
Fusión de la epífisis del calcáneo (hombres)	< 20 años	11-20 años	> 11 años
Fusión de la epífisis del astrágalo (hombres)			> 12 años
Fusión de las epífisis de las falanges proximales y de la base del metatarso 1 (mujeres)	< 15 años	13-15 años	> 13 años
Fusión de las epífisis de las falanginas y falangetas y de las cabezas de los metatarsos 2-5 (hombres)	< 16 años	14-16 años	> 14 años
Fusión de las epífisis de las falanges proximales y de la base del metatarso 1 (hombres)	< 18 años	16-18 años	> 16 años

EDAD ESTIMADA SEGÚN OSIFICACIÓN Y FUSIÓN DE ELEMENTOS ÓSEOS:

EDAD ESTIMADA:

Trauma Recording Form

Project:	Burial No.	Analyzed by:
Site:	Skeleton Nº:	Date:
Sector:	Box:	Location:

Individual

Sex: **Age:** **Social Status:**

Pathological conditions (summary):

Description of the lesion(s)

Type (fracture, dislocation, PNBF, etc.):

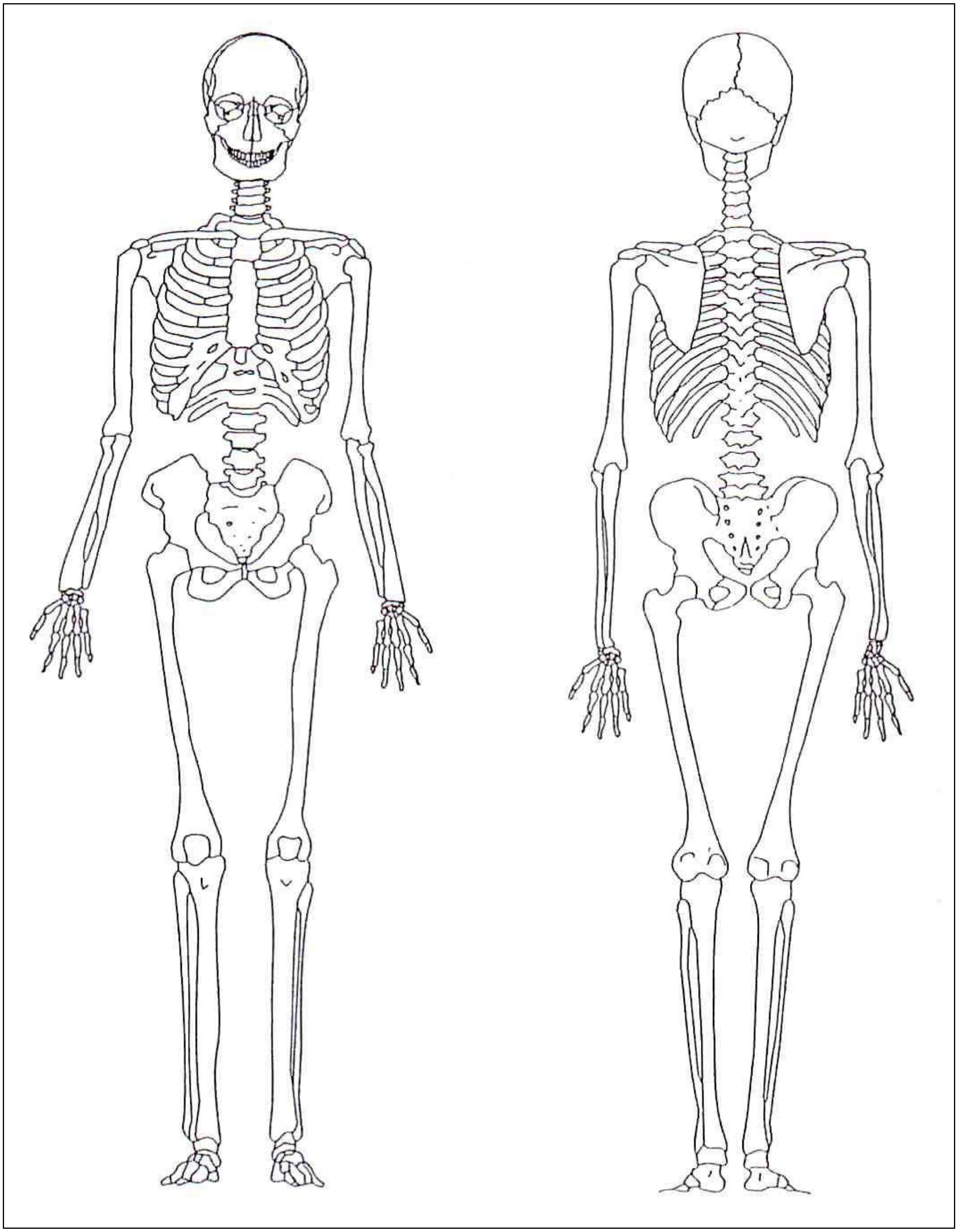
Location

Bone: **Side:** **Segment:**

Timing: **Causative Weapon:** **Lethal Potentiality:**

Measurements:

Characteristics:



Curriculum Vitae

Post-secondary Education and Degrees:	Pontificia Universidad Católica del Perú Lima, Peru 1994-1999 B.A.
	Pontificia Universidad Católica del Perú Lima, Peru 2007-2009 M.A.
	The University of Western Ontario London, Ontario, Canada 2010-2016 Ph.D.
Honours and Awards:	Annual Investigation Award (Instituto Riva Agüero-PUCP) 2008
	Extraordinary Award "Galileo" (PUCP) 2009
	Faculty of Social Science Dean's Scholarship (UWO) 2009
	Western Humanitarian Award 2011
	Liderazgo Latino Award: Woman of the Year (Magazine Latino). London, Ontario, Canada. 2012
	The Cockburn Student Prize (PAMinSA) 2013
	Anthropology Department Internal Scholarship (UWO) 2010-2014
	Vanier Canada Graduate Scholarship 2012-2015
Related Work Experience	Teaching Assistant The University of Western Ontario

2010-2012
Adjunct Professor
Pontificia Universidad Católica del Perú
2016

Independent Bioarchaeological Research
Ánimas Altas (2016) Las Shicras (2012-2014), Tramo de Colector Las Piedritas-Copacabana (2013), Huaca 20 (1999, 2006-2009, 2013), Karwa (2012), Chavín de Huantar (2011), Huantinamarca (2009-2010), Pampa Melchorita-Chilca (Loop Costa) (2009-2010), San José de Moro (2005-2007, 2009-2010), San Juan de Pariachi (2008), Pueblo Viejo-Pucará (2001-2002, 2005-2007), Complejo Turístico Recreativo Asia (2006), Camisea- Frente Sierra 2 (2004), Cerro Lampay (2003), Armatambo (2003), and Cajamarquilla (2000-2002).

Jr. Forensic Expert and Forensic Trainer
Peruvian Forensic Anthropology Team (EPAF)
2006-2010, 2015-2016

Publications:
Books:

Watson, Lucía, María del Carmen Vega, Carmen Rosa Cardoza, and Alain Wittmann
2008 Civil Society Manual on the Use of Forensic Sciences in the Investigation of Extrajudicial Killings and Enforced Disappearances. USAID, the Asia Foundation, and EPAF.

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Vega-Centeno, Rafael, María del Carmen Vega, and Patricia Landa
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2014 Niveles y patrones de violencia durante la transición al Horizonte Medio en la costa central peruana. *Boletín de Arqueología PUCP* 18:105-127.

Selected Presentations:

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2009 Comparación de diferentes métodos utilizados para la identificación en un caso peruano. Paper presented to the V Congress of the Latin American Association of Forensic Anthropology – ALAF, Buenos Aires. Sede de la Asociación Médica Argentina (AMA). October 26-28, 2009.

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2011 Estimación de sexo en subadultos de ancestralidad andina en base a morfología de mandíbula e ilion, y mediciones en molares y caninos deciduos. Paper presented to the VII Congreso de la Asociación Latinoamericana de Antropología Forense – ALAF, Ayacucho, Perú. October 26-30, 2011.

2011 Evidencias de treponematosis en una población del Formativo Temprano del valle de Asia (costa central del Perú). Paper presented to the IV Reunión de la Asociación de Paleopatología en Sudamérica PAMinSA IV, Lima. November 2-5, 2011.

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