A Biohistorical Approach to Spanish Conquest and Colonization

Research Thesis

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by

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ABSTRACT

European introduction into the Western Hemisphere brought unprecedented physical and cultural changes to Native Americans. The goal of this thesis is to explore why North and South American Native groups experienced a variety of levels of contact experience with the Spanish. This thesis employs a historical and bioarchaeological interdisciplinary approach to identify a variable that could predict the degree of biological impact that Native Americans experienced during Spanish conquest and colonization. To analyze Native-Spanish interactions I present an in-depth look into three bioarchaeological case studies, including the Guale of the Georgia Bight, the Tipu Maya of Belize, and the Moche of Mórrope, Peru.

I found that despite these three sites all interacting with the Spanish, the consequences of Spanish contact were different in each location. The Tipu Maya displayed little negative biological impact due to their location in the Spanish borderlands. The Guale and Moche both experienced the negative biological impacts of aggregation. The Moche specifically experienced the establishment of *reducciónes* and the Guale had the additional physical burden of the *repartimiento* labor system. Additional comparisons with other sites that had commonalities with the Guale, Tipu Maya, and Moche revealed little overlap in contact experience. Given the current state of contact research, I found that there are limited variables that could predict the consequences of Native-Spanish contact. The variation in the impacts of European contact is dependent upon the individual context and circumstances of each site or Native group. This research is important because if we can understand the outcome of past cross-cultural interactions on individual and population health, then we can understand modern interactions and the consequences it could be having on our own health.

INTRODUCTION

During the sixteenth century, Native American and European interactions in the New World took many forms. So, it should be no surprise that when we look at the bioarchaeological and historical records across North, Central, and South America, European contact impacted each Indigenous group differently. All of the European countries that sought out a piece of the New World did so in their own ways, based on their motivation. For example, early English settlers traveled to North America for religious freedom, so they were tolerant of the Indigenous populations surrounding their colonies (Baker 2013). Alternatively, Spanish explorers were profit-hungry, so they followed a violent, slavery-ridden path to build an empire on the backs of the Indigenous peoples (Deeds, Meyer, & Sherman 2018; Restall 2003). Spain was one of the first European nations to discover the Western Hemisphere. Evidence shows that the Spanish had a standardized strategy for taking over North, Central, and South America (Restall 2003). Why then, when we look specifically at Native and Spanish interactions, do we see a variety of levels of biological impact left in the skeletal remains of the Native populations?

In this thesis, I will use an interdisciplinary biohistorical approach to identify one commonality that can predict the level and success of the Native-Spanish contact experience. The goal of this thesis is to be able to answer why we see variation in the levels of biological impact left in the skeletal remains of contact era Native Americans. My historical research will provide historical background leading up to Spanish exploration in the Western Hemisphere and how Spain conquered and colonized North, Central, and South America. The bioarchaeological portion of this thesis will then incorporate the historical record to understand the biological impacts of contact in the indigenous populations. My research will be built off of decades of

research conducted by many devoted biological anthropologists and historians (Cohen et al. 1994; Klaus 2008; Larsen 2001; Restall 2003).

In this thesis, I will give historical background of Spain's history from the Old World *Reconquista*, to the New World Spanish conquest, and the colonization of New Spain. Next, I will examine three different bioarchaeological case studies to investigate the biological impacts of Spanish contact on Native populations, namely the Guale of the Georgia Bight region, the Tipu Maya of Belize, and the Moche of Mórrope, Peru. My analyses will include a discussion and pattern interpretation among the case studies to determine any commonality reflecting the impact level and success of contact. To conclude this thesis, I will explore how my research may be expanded to understand modern human interactions.

BACKGROUND

Christopher Columbus's landing in the Caribbean launched three centuries of exploration, conquest, and colonization (Deeds, Meyer, & Sherman 2018; Phillips and Phillips 2016; Taylor 2001). England, Spain, France, and the Netherlands all rushed to claim a piece of North and South America to expand their territory, extract resources, and enhance their wealth (Taylor 2001). Each country dealt with the Native societies encountered in a variety of ways, ranging from violent and domineering to passive and tolerant. The interaction quality depended on where the explorers originated from, their proximity to the Natives, and the type of relationship, political and interpersonal, established between the foreigners and the Natives (Baker 2013). European arrival in the New World resulted in many consequences for the Indigenous peoples. Native lives were transformed physically, culturally, linguistically, materially, and more, in both harmful and unharmful ways. Modern research attempts to

reconstruct the lives and experiences of the Native Americans so that we can learn how intercultural interactions shape the health, identity, and culture of living groups.

HISTORICAL BACKGROUND

Brief History of the Iberian Peninsula to Christopher Columbus

Spain had a prior history of conquest before coming to the New World. In the eighth century C.E., Muslim Moors from Africa invaded the Iberian Peninsula and overtook the Christian Visigoth territories (Phillips and Phillips 2016). In the eleventh century C.E., the remaining Christians began launching a series of military campaigns against the Muslims. This is known as the *Reconquista*, or re-conquering of the previously Christian Iberian Peninsula, and it lasted until the thirteenth century C.E. (Phillips and Phillips 2016). The *Reconquista* began because the Christian kingdoms in the North had small territories and they wanted more land and profit. The Christian kings valued their economic relationships with the Muslims and tolerated their religious differences and vice versa (Phillips and Phillips 2016). Therefore, the battles' original intent was not about expelling Islam from the peninsula. However, during the latter part of the *Reconquista*, the Catholic church became more involved, often issuing military orders, and they did want Islam removed from Europe (Phillips and Phillips 2016). The *Reconquista* had a lasting legacy in Spain, and it would serve as an example of what the Spanish conquest could accomplish in the New World.

There are several parallels between the *Reconquista* and the Spanish conquest. First, they both began in the pursuit of resources (Deeds, Meyer, & Sherman 2018; Phillips and Phillips 2016). Second, it is not until the later years of both conquests that the Catholic church began to play a major role. Many of the knights who led the later crusades during the *Reconquista* were provided support directly from Christian Popes (Phillips and Phillips 2016). Many later

Conquistadors brought friars with them to the New World to convert the Indigenous people (Deeds, Meyer, & Sherman 2018). In addition, recently conquered Muslims and Natives were forced to offer tribute to their new rulers (Deeds, Meyer, & Sherman 2018; Phillips and Phillips 2016). Both the Native American's and African Muslims could offer large quantities of gold, which was highly valued in the Iberian Peninsula. Finally, both the *Reconquista* and Spanish conquest would later be closely linked with the spread of Christianity, through the use of violence and various manipulative tactics.

As the *Reconquista* battles pressured on, the expanding Christian kingdoms struggled to get along. According to Phillips and Phillips (2016), this changed in 1468 when King Ferdinand II of Aragon and Queen Isabella of Castile married, uniting most of what we now recognize as Spain under one leadership. The final battle of the *Reconquista* took place in 1492. The Christians defeated the only remaining Muslim territory on the Iberian Peninsula, and they were forced out (Phillips and Phillips 2016). In the meantime, Spain had developed into an economically wealthy nation (Deeds, Meyer, & Sherman 2018; Phillips and Phillips 2016). They had highly profitable sectors such as manufacturing, livestock raising, and agriculture. These sectors benefited from Spain's extensive trade routes along the Atlantic and Mediterranean Sea. With the fall of the final Muslim kingdom, the king and queen of Spain began looking for new ways to expand their power and wealth (Phillips and Phillips 2016). They sponsored an experienced explorer Christopher Columbus to find a direct western route to Asia to establish trade agreements with Asian empires (Deeds, Meyer, & Sherman 2018; Phillips and Phillips 2016; Taylor 2001).

With his sponsorship from the king and queen of Spain, Christopher Columbus and his company of an estimated 90 men set sail to find a new westward route to Asia in 1492 (Deeds,

Meyer, & Sherman 2018; Restall 2003; Weber 1994). After five weeks on the ocean, Columbus and his men made landfall in the Bahamas on an island called Guanahani, as it was called by the Natives (Restall 2003). Although this land was mistaken for East Asia, the explorers had discovered a trove of precious metals, exotic animals, and potential human labor. Columbus returned to Spain with samples of the New World, including several Indigenous people, gold, plants, and birds (Deeds, Meyer, & Sherman 2018). Columbus's arrival into the New World presented a new source of wealth and power for Spain.

Conquering New Spain

Early Spanish interest in the New World was focused on the Caribbean islands and the resources that could be extracted from the landscape by the Natives (Deeds, Meyer, & Sherman 2018; Taylor 2001; Weber 1994). In the beginning, the main source of income came from Indigenous laborers who were forced to pan and mine for gold (Deeds, Meyer, & Sherman 2018). Agriculture offered little profit and only a few islands in the surrounding area were settled on (Taylor 2001). Eventually Spanish explorers ventured up to the Atlantic coast of Florida, west into Central America, and south into South America. As the explorers interacted with native groups, they learned of vast riches and large cities that lay deeper into the New World (Deeds, Meyer, & Sherman 2018). Their focus shifted to finding and conquering these cities to extract their wealth and resources for Spain.

The men who ventured to the New World did so to gain profit, fame, and to (eventually) spread Christianity (Deeds, Meyer, & Sherman 2018; Restall 2003). Profit came in the form of gold, jade, turquoise, and quetzal feathers, acquired through force or trade (Deeds, Meyer, & Sherman 2018). These materials would be collected and taken back to Spain to be sold. Fame could be earned by Conquistadors who conquered large Indigenous nations, like the Inca, Aztecs,

and Itzá Maya (Restall 2003). They then had to write a letter to the king and queen pledging their allegiance to Spain in order to receive a permit to govern the new territory.

The final goal of the explorers was to spread Christianity (Deeds, Meyer, & Sherman 2018; Restall 2003). It is suggested that this was not a major source of motivation at the beginning of the Spanish conquest, but like the *Reconquista*, eventually converting the Indigenous peoples became a priority because it meant that they would be easier to control and rule over (Restall 2003). The king and queen of Spain limited the number of religious representatives that could travel to the New World in the first years of conquest because they did not want the Catholic church to run the Spanish empire in the New World (Deeds, Meyer, & Sherman 2018). When the religious representatives arrived, they established mission compounds, forced Natives to move into them, and destroyed all remains of Native tradition, culture, and religion.

A common misconception is that the Spanish crown sent armies to conquer the New World. Instead, the Spanish conquest was accomplished by untrained, armed adventurers (Deeds, Meyer, & Sherman 2018; Restall 2003). Historian Matthew Restall (2003) describes the typical conquistador as, "a young man in his late twenties, semi-literate, from southwestern Spain, trained in a particular trade or profession, seeking opportunity." Young men would volunteer themselves to the companies sailing to the New World in hopes of returning to Spain with wealth and status. They were accompanied by thousands of African individuals, both enslaved and free (Restall 2003). Then, when the companies traversed land, they were often accompanied by their Native allies. Restall (2003) emphasizes that throughout the Spanish conquest, it was not uncommon for the Spaniards to be greatly outnumbered by their African and Native counterparts.

Early Spanish explorers and conquerors established an effective system for terrorizing and subduing the Native populations (Deeds, Meyer, & Sherman 2018; Restall 2003; Weber 1994). This system is often referred to as the "conquest procedure." Upon first arriving at a Native establishment the Conquistadors used legal measures to validate their invasion. After 1513 this took the form of Conquistadors reading aloud the *Requerimiento*, a legal document announcing Spain's right to conquest (Restall 2003). The Spanish explorers would then form alliances with several smaller sized Native groups for protection, information, and military assistance. As they traveled, they would capture multilingual individuals to serve as interpreters for the Spanish (Deeds, Meyer, & Sherman 2018). When they arrived at large, powerful Native cities the Spanish would attempt to establish dominance over the Natives through the use of, often theatrical, violence (Restall 2003). This violence was a scare tactic and it included mutilation, killing of women, and massacres. In a more significant demonstration of theatrical violence, the Spanish would publicly seize the Native ruler (Restall 2003). At this point, the Native group was considered subdued because the Spanish had captured their leader. In this regard, the Conquistador would write back to the crown to be granted governorship over the exploited territory. Finally, the conquistadors and their Native allies would begin to search for precious metals, such as gold and silver, in their new territory (Deeds, Meyer, & Sherman 2018; Restall 2003; Weber 1994).

The "conquest procedure" is well documented in historical literature, including both Spanish and Native documents (Restall 2003). This process set the standard for all Spanish Conquistadors and helped them conquer the major New World empires, such as the Aztecs. Within 50 years of Christopher Columbus's landing in the New World in 1492, the Spanish had

located and occupied all major population centers in the Americas. The penetration of the more thinly populated areas was well underway Deeds, Meyer, & Sherman 2018; Weber 1994).

Spanish Conquistadors and their "conquest procedure" were successful for several reasons. First, the introduction of Old World diseases (e.g., smallpox, malaria, cholera, influenza, measles, and yellow fever) played a major role in weakening the Native populations and reducing their numbers (Deeds, Meyer, & Sherman 2018; Restall 2003; Taylor 2001; Weber 1994). Second, Indigenous groups were not unified (Restall 2003). They competed for land and resources and went to war with each other often. Much of the disunity stemmed from the larger, more powerful cities demanding tribute from nearby villages, in the form of labor, resources, and human sacrifices (Deeds, Meyer, & Sherman 2018; Restall 2003). As a result, the villages resented the powerful empires. Spanish Conquistadors took advantage of the Native disunity by creating alliances with the small Indigenous villages and then using them to fight against the large empires (Restall 2003). For example, on Cortés's way to Tenochtitlán, the capital of the Aztecs, he acquired alliances and warriors from nearby villages who paid the Aztecs tribute (Deeds, Meyer, & Sherman 2018; Restall 2003). They helped Cortés defeat the Aztecs. Another disadvantage the Natives faced was their ritual practices of war. Some Indigenous traditions required fighting during certain times of the year to collect sacrifice victims and tributaries and planting or harvesting during other parts of the year (Deeds, Meyer, & Sherman 2018). The Natives were unprepared for Spanish warfare when it disrupted their agricultural cycle, which left them with little food (Deeds, Meyer, & Sherman 2018; Restall 2003). Lastly, Spanish warfare technology was advantageous against Native weaponry (Deeds, Meyer, & Sherman 2018; Restall 2003). Spanish explorers had crossbows that could pierce Aztec armor, horses, war dogs, steel swords, and cannons. These weapons initially helped the Spanish terrorize and subdue

Native Americans. However, as battles progressed during the conquest, Spanish technology became less effective because the Natives learned the limitations of the technology (Restall 2003). For example, cannons could only shoot straight. As a result, Native groups adapted their warfare strategies. The Spanish used their advantages to establish and build an empire in the New World. The next step was to create a strong economy to entice settlers.

Colonizing New Spain

To build New Spain, Conquistadors would attempt to establish colonies in conquered territories (Deeds, Meyer, & Sherman 2018; Restall 2003; Taylor 2001; Weber 1994). Spanish colonies were to attract settlers, establish various revenue pathways, build a thriving economy, and send the wealth back to Spain (Taylor 2001). Indigenous labor was the backbone of New Spain's economy. Spain created several legal labor systems to employ New Spain's Native labor force to build the colonies and economy. The crown was aware that abusing the Indigenous populations would reduce the size of the labor force, so they made an effort not to overwork them (Restall 2003).

The first system that was implemented was the *Encomienda* labor system, which was first used during the *Reconquista* against the Muslim Moors (Deeds, Meyer, & Sherman 2018; Restall 2003; Taylor 2001; Weber 1994). The crown awarded a Conquistador an *encomienda* which provided them with an Indigenous labor force who were required to provide tribute and free labor (Deeds, Meyer, & Sherman 2018). An *encomendero* had to provide care for, protect, instruct Christian faith, and allow their Indigenous labor force to use their own land for farming. However, poor regulations allowed *encomenderos* to abuse and mistreat the Natives (Restall 2003; Taylor 2001).

The Spaniards also created *reducciónes*, or Native settlements to aid colonization and shape the landscape for incoming settlers (Deeds, Meyer, & Sherman 2018; Restall 2003; Taylor 2001; Weber 1994). These settlements were formed by forcibly relocating several Native communities into one place. Relocation was meant to break down tribal lines, erase Indigenous cultural traditions, and make it easier to introduce Spanish traditions to the Natives (Taylor 2001). *Reducciónes* also provided a labor pool for *encomenderos* to select from. The *encomienda* and *reducción* systems aided European settlement startups by providing a labor force and tribute in the form of materials and agricultural products.

Another labor system Spain implemented in New Spain was *repartimiento*. This system was created as a substitute for the *encomienda* system in 1542 because it had grown corrupt and unethical (Deeds, Meyer, & Sherman 2018; Restall 2003; Taylor 2001; Weber 1994). In the *Repartimiento* system, Native adult males were selected to work in cycles (days, weeks, months, or years) in mines, workshops, farms, or on public projects deemed essential by the crown (Deeds, Meyer, & Sherman 2018). The Natives were supposed to be fed, housed, and paid a wage for their labor. However, no one was given the responsibility to look over the well-being of the Native population. For this and other reasons, their health deteriorated. The Natives would be taken far from home for long periods of time, provided poor housing and little food, and in most cases, they were not paid for their service (Deeds, Meyer, & Sherman 2018). *Repartimiento* became as corrupt as the *encomiendas* and both systems contributed to dramatic declines in Native health.

Spanish methods of conquest, colonization, and indoctrination had an unambiguous negative impact on the lives of the Native Americans. In the next section of my thesis, I present

three different bioarchaeological case studies that represent three different experiences of Native-European contact.

BIOARCHAEOLOGICAL CASE STUDIES

Guale of the Georgia Bight

Hypotheses

The first case study I will introduce takes place in the Georgia Bight region, which extends from Cape Hatteras, North Carolina to Cape Canaveral, Florida (Larsen et al. 2001; Larsen et al. 2002). Research in this region has been taking place for several decades and is made up of the collaboration of many researchers and institutions. This study aims to learn more about the adoption of maize agriculture and European-Native American contact/colonization in North America and how these events impacted Native behavior, activity, and health (Larsen et al. 2001). In this thesis, I will be focusing on their analyses of the impact of European contact on the Indigenous populations.

Region Background

Due to an abundance of historical records from this region, researchers were able to divide the Georgia Bight populations into several temporal groups that reflect major shifts (Larsen et al. 2001; Larsen et al. 2002). They are the precontact preagricultural (1100 BC-1150 AD), precontact agricultural (AD 1150-1550), and contact period groups. The latter is divided into early (AD 1550-1680) and later (AD 1686-1702) mission populations.

The precontact agricultural population sample (AD 1150-1550) comes from 23 mortuary sites along the coast of Georgia (Larsen et al. 2001; Larsen et al. 2002). They are characterized by an increased dependence on maize, continued consumption of marine foods and terrestrial

plants and animals that prehistoric peoples consumed, an increase in population size, increased sedentism, and transition to a complex chiefdom.

Early European introduction in the Georgia Bight consisted of short-term explorations and failed colonial establishments by the French and Spanish (Larsen et al. 2001; Larsen et al. 2002). Long-term negative biological impacts on the Native populations are hard to define from this period of exploration. The second wave of European-Native interaction occurred in 1565 when the Spanish expelled the French from the region (Larsen et al. 2001; Larsen et al. 2002). The Spanish were then able to successfully establish a permanent colony at St. Augustine, and they established several Catholic missions along the coast. Mission Santa Catalina was the northernmost and the main mission site, located on St. Catherines Island. Natives in the surrounding area, called the Guale, were forced to move to Mission Santa Catalina and they lived in long-term close contact with Spaniards (Larsen et al. 2002). Santa Catalina de Guale was active from around the 1570s to 1680. Excavations from a church in Santa Catalina de Guale yielded 432 individuals (Larsen et al. 2001; Larsen et al. 2002). This population makes up the early contact group (AD 1550-1680). They are characterized by even more maize consumption, as well as some European foods, and close quarter living circumstances. The Spanish also implemented the *repartimiento* system labor system once they established the colony (Larsen et al. 2002).

Conflict with Britain caused the site on St. Catherines Island to be abandoned in 1680 (Larsen et al. 2002). The mission relocated to Amelia Island, Florida in 1685. Excavations from this new site yielded 122 individuals that make up the late contact group (AD 1686-1702). The late contact sample was subject to the same living, eating, and working conditions of the early contact group and they display signs of increased dependence on maize (e.g., elevated dental

caries prevalence) (Larsen et al. 2001; Larsen et al. 2002). Santa Catalina de Santa Maria at Amelia Island was abandoned in 1702 due to continued conflict with Britain.

Sample Information

The data in this study were collected from 27 sites across three temporal populations: precontact agriculturalists (n=517), early contact (n=444), and late contact (n= 122) (Larsen et al. 2001; Larsen et al. 2002).

Methods, Results, and Analyses

Larsen et al. (2001; 2002) assessed several skeletal indicators of health, stress, and wellbeing in the Georgia Bight populations. They then compared the precontact agriculturalist population sample with the early contact population sample to investigate the impact of European contact and mission establishment. Early contact and late contact population comparisons aimed to assess the long-term impact of missionization on the Native Americans (Larsen et al. 2002). Below are explanations of several investigations into specific indicators, their results, and implications.

Enamel defects. Larsen et al. (2001; 2002) found a decrease in the prevalence of enamel defects from the precontact agriculturalist population to the early contact population, then a significant decrease in the prevalence of the late contact population. These results are highly significant. These results indicate the rate of stressful events decreased overtime for the inhabitants of the Georgia Bight. However, the researchers point out that while the late contact period has the least amount of hypoplasias, the width of the hypoplasias that they do have are wider than the other temporal populations (Larsen et al. 2001; Larsen et al. 2002). Hypoplasia width is indicative of more severe or longer-lasting stress. Given the relatively small dentition sample size of the late contact group (n=118), this sample has a comparatively high rate of both

enamel micro and macrodefects (50 percent). Therefore, Larsen et al. (2001; 2002) suggest this to be evidence of a continued decline in health and wellbeing through the late contact period.

Osteoarthritis. Larsen et al. (2001; 2002) assessed the vertebrae, hand joints, wrists, hips, and shoulders of the Santa Catalina de Guale and Amelia Island populations for osteoarthritis. Assessing degenerative joint disease in past populations helps reconstruct labor and lifestyle activities that have implications on the health of populations. Larsen et al. (2001; 2002) found a significant increase in the frequency of osteoarthritis in the late mission period. The increase in frequency is most notable in the vertebrae of both males and females. From the late prehistoric population of Georgia to the late mission site in Florida cervical osteoarthritis increase from 16.4 percent to 68.3 percent, thoracic osteoarthritis increased from 11.4 percent to 68.3 percent, and lumbar osteoarthritis increased from 24.5 percent to 67.2 percent (Larsen et al. 2001; Larsen et al. 2002). Shoulder and wrist osteoarthritis also significantly increased. The researchers suggest that the increase in osteoarthritis during the late mission period reflects the continued implementation of the *repartimiento* labor system, which required men to travel to distant places carrying heavy objects and worsened the physical health of the population (Larsen et al. 2001; Larsen et al. 2002).

Periosteal reactions. Comparative analyses revealed that there is an increase in frequency and severity of periosteal reactions on the tibia, especially in the late contact period (Larsen et al. 2001; Larsen et al. 2002). Periosteal reactions were found on other areas of the skeleton, but the most striking change was on the tibiae. Also, the increase in periosteal reactions is more pronounced in adult males (23.1 percent in early contact versus 90.0 percent in the late contact) compared to adult females (14.3 percent in early contact versus 65.7 percent in late contact) (Larsen et al. 2001; Larsen et al. 2002). Larsen et al. (2001; 2002) posit that the increase

in periosteal reactions could be linked to the unhealthy circumstances of mission life, such as decreased mobility, poor diet, increased aggregation, and physical labor demands. Periosteal reaction analysis supports the idea that Spanish contact and mission life worsened the health of the Guale population overtime.

Infectious disease. The Spanish missions were breeding grounds for epidemic diseases. Historical evidence reveals that Old World diseases, such as measles and smallpox, combined with unhealthy mission life caused many Native deaths in the missions (Larsen et al. 2001; Larsen et al. 2002). Epidemic diseases rarely present on the skeleton, so the researchers are dependent on the historical record. However, there is evidence for other specific and chronic infectious diseases. Some sites from this region, including the Irene Mound site, a late prehistoric life center, have yielded individuals with signs of tuberculosis and treponematosis. Larsen et al. (2001; 2002) noted that infectious disease prevalence increased consistently over time even before European introduction, but this evidence still speaks to the ill health of the Guale populations that was exacerbated by European contact and mission life.

Iron status and anemia. Cribra orbitalia and porotic hyperostosis are skeletal indicators of iron-deficiency anemia (Larsen 2015). The precontact populations of the Georgia Bight had low levels of both pathologies (Larsen et al. 2001; Larsen et al. 2002). While maize is a poor-quality food, it is suggested that maize consumption in combination with marine foods, which was common for the precontact populations, can be a healthy source of iron (Larsen et al. 2002). This is a possible explanation for the low levels of cribra orbitalia and porotic hyperostosis in the precontact samples. Both pathologies increased in frequency in the early contact and late contact periods, particularly inflicting subadults (Table 1). Larsen et al. (2002) assert that the increase in iron-deficiency anemia pathologies during the mission period is due to an overdependence on

maize, rather than marine resources, and mission lifestyle. Mission life subjected Native peoples to poor hygiene, contaminated water, and parasites, which can all lead to iron-deficiency. The change in prevalence of cribra orbitalia and porotic hyperostosis between the precontact and postcontact populations indicates the transition to a worse and unhealthy lifestyle introduced by European establishment in the Georgia Bight.

Table 1: Frequency of Cribra Orbitalia and Porotic Hyperostosis by Temporal Period (Larsen et al. 2001)

	Early Prehistoric	**Late Prehistoric**	**Early Contact**	**Late Contact Florida**
Cribra Orbitalia				
Total	5.7 (104)	3.1 (287)	14.0 (121)	22.9 (70)
Juvenile	38.5 (13)*	6.1 (33)*	21.7 (23)*	73.3 (15)*
Porotic hyperostosis				
Total	0.0 (113)	3.3 (308)	15.8 (133)	21.1 (90)
Juvenile	0.0 (13)*	0.0 (33)*	20.0 (25)*	50.0 (18)*

*significant change

Discussion

Larsen et al. (2001;2002) agreed that Spanish contact and mission establishment in the Georgia Bight region marks the beginning of the decline of health and wellbeing for the Guale people. Bioarchaeological analyses uncovered general signs of decreased health. Many of the negative indicators of health and stress were linked with mission establishment. Mission sites increased aggregation, contaminated water supply parasites, poor-quality diet, and more infectious disease. The Guale of the Georgia Bight offer an insight into not only the impact of Spanish contact and colonization of the New World, but they offer insight into the specific ways in which mission lifestyle and *repartimiento* impacted the bodies and health of the Natives.

Maya of Tipu, Belize

Hypotheses

The second case study I will review takes place in Tipu, Belize and it presents a unique Native experience during European contact (Cohen et al. 1994; Harvey, Danforth, and Cohen 2017). The researchers investigated postcontact biocultural change among the lowland Maya on the Yucatán Peninsula as a result of European contact. Harvey, Danforth, and Cohen (2017) postulated that there should be a sharp contrast in levels of biocultural change between inland and coastal populations of the Yucatán Peninsula due to less direct contact and control by the Spanish. In this study they look at the creation of new identities in inland populations postcontact and negative biological consequences of European interactions that are prevalent across other colonial Maya sites (Harvey, Danforth, and Cohen 2017). In this thesis, I will focus only on the second part of the study, which attempts to explain why the Native population of colonial Tipu, Belize displays no negative biological effects of intercultural contact. Harvey, Danforth, and Cohen (2017) suggest that due to Tipu's inland position, its members had an advantage by being able to better negotiate their new relationships with the Spanish colony.

Region Background

Tipu is part of a series of Spanish colonial-era mission sites in the Yucatán lowlands (Cohen et al. 1994; Harvey, Danforth, and Cohen 2017). These sites stretched across the northern border of Belize down to the eastern part of Guatemala, near Lake Petén Itzá. The mission sites were administered by the Spanish capital, Salamanca de Bacalar, and the sites were set up as *visita* missions, meaning a priest and local converts stopped by occasionally (Cohen et al. 1994; Harvey, Danforth, and Cohen 2017). Tipu was the southernmost *visita* and it was in the Spanish-controlled borderlands between areas of firsthand Spanish control and areas controlled by Itzá Maya in Petén. Tipu served as a refugee center for Yucatecán Maya refugees fleeing from Spanish control and it was a center for cacao trading (Harvey, Danforth, and Cohen 2017).

Around AD 1517 Spanish soldiers traveling from Cuba to Yucatán introduced epidemic diseases to the region (Cohen et al. 1994; Harvey, Danforth, and Cohen 2017). Epidemic diseases would continue to move across the region during the sixteenth and seventeenth centuries, and they were the first indirect consequence of contact that Tipu experienced. As a result, when the Spanish first arrived at Tipu in 1544 their population had dwindled from 800,000 to about 250,000 (Harvey, Danforth, and Cohen 2017). Still though, Tipu was a town of considerable size and importance at first contact. Tipu inhabitants rebelled against the Spanish in AD 1544. Initial Spanish contact in Tipu did start trade between the two cultures but did not result in major community reorganization or cultural change (Harvey, Danforth, and Cohen 2017). However, between AD 1567-1568, Tipu was occupied as a Spanish military base in an attempt to control surrounding areas. This direct Spanish control did affect Tipu and its residents because they imposed the Spanish *reducción* system as they conquered the surrounding Maya lowlands (Harvey, Danforth, and Cohen 2017). The *reducción* system forced many Mayan groups from the region to come together at Tipu. Despite the Spanish intrusion, Tipu was able to remain mostly autonomous and independent at this time. In AD 1638, the Tipu Maya subverted and forced the Spanish out and they remained independent until the 1690s when they decided to reestablish their relationship with Spain (Harvey, Danforth, and Cohen 2017). In 1707 Tipu was unoccupied when its inhabitants were forcibly relocated to Petén, in modern-day Guatemala.

Sample Information

Dr. Cohen and his staff excavated approximately 600 individuals from the Tipu church and cemetery (Harvey, Danforth, and Cohen 2017). Of these 600 individuals 588 dated to the colonial period. From the colonial era population there were 173 males, 119 females, 47 unidentified adults, and 249 children.

Methods, Results, and Analyses

Harvey, Danforth, and Cohen (2017) assessed the health of the Tipu population by looking at subadult indicators of biological stress and wellbeing, including long bone growth, stature, and enamel defects, and adult indicators of health and wellbeing, such as periosteal reactions and skeletal trauma. To understand their results in the greater context of the contact era and the Yucatán Peninsula, Harvey, Danforth, and Cohen (2017) compared Tipu with other precontact and postcontact Mayan populations.

Long bone growth. Danforth et al. (2009) measured the humeri, femora, and tibiae from 96 Tipu subadults. The results were compared to femoral growth curve results from other North American studies, namely Arikara, Indian Knoll, and Late Woodland populations (Harvey, Danforth, and Cohen 2017). Danforth et al. (2009) found Tipu's subadult populations emulated typical childhood growth curves. An investigation of cortical bone area and femoral diaphyseal length from 96 Tipu subadults showed that bone thickness and femoral diaphyseal length steadily and regularly increased through childhood (Harvey, Danforth, and Cohen 2017). Growth patterns of subadult Tipuans suggest that they did not experience protein-calorie malnutrition and that bone development followed normal patterns.

Stature. Researchers assessed the maximum femur length of 148 adult Tipu males and 106 adult Tipu females (Cohen et al. 1994; Harvey, Danforth, and Cohen 2017). They found that on average colonial Tipu males were 160.3 cm tall and females were 148.3 cm tall. Danforth (1999) compared these values with other precontact lowland Maya sites (Table 2). She found that stature in Tipu was not negatively impacted by contact. The data demonstrated that there was no decline in Tipu terminal adult stature and that the population reflected normal Maya stature levels.

Table 2. Average adult stature by sex from several lowland Maya sites (Harvey, Danforth, and Cohen 2017)

Time Period and Site	N	Average of Adult males (cm)	N	Average of Adult females (cm)
Late classic				
Altar de Sacrificios	2	162.3	2	153
Barton Ramie	10	156.6	6	145.7
Copán	10	158	16	147.2
Palenque	3	158.8	1	148
Seibal	18	159.1	4	145.7
Tikal	21	157.4	11	148.7
Postclassic				
Sarteneja	3	163	1	146.7
Colonial				
Tipu	149	160.3	106	148.3
Modern	128	155.5	94	142.8

Enamel macrodefects. Linear enamel hypoplasias (LEH) reflect long-term, chronic disruption of bodily homeostasis, and were assessed from a dental sample of 375 Tipuan individuals (Harvey, Danforth, and Cohen 2017; Larsen 2015). Of these, 237 canines and 241 incisors were observable for LEH lines (Harvey, Danforth, and Cohen 2017). 97% of the canines had at least one defect and 79% of central incisors had defects. Subadults displayed the highest number of hypoplasias, and they also had a higher prevalence of moderate to severe hypoplasias. To interpret these findings, Harvey, Danforth, and Cohen (2017) compared the LEH frequencies of Tipu and other precontact Maya sites, such as Cuello (Preclassic) and Colha (Classic). Compared to the precontact Mayan populations, Tipu had a significantly higher frequency of enamel defects. This is not surprising considering the stress that came with European colonization. Another study compared Tipu with other postcontact Maya sites, including Campeche and Lamanai (Harvey, Danforth, and Cohen 2017). Tipu subadults showed lower

levels of hypoplasias compared to other postcontact Maya populations. In summary, it appears that Tipu subadults faced more biological stress than precontact populations but less biological stress than other postcontact populations. This supports the notion that Colonial Tipu was a unique and less stressful environment in the Yucatán Peninsula during Spanish colonialism.

Enamel microdefects. Analyses of striae of retzius and Wilson lines, both indicative of short-term stress, on Tipu subadult dentition suggested no evidence of high levels of stress linked with epidemics, endemic diseases, or malnutrition (Harvey, Danforth, and Cohen 2017). They found that the health of the postcontact Tipu subadult population appears to be generally healthy. This further supports that childhood in Tipu was healthier and less stressful compared to other colonial Maya populations.

Periosteal reactions. Periosteal reactions are an inflammatory response in which new bone is formed in response to a disruption in the periosteum, such as infection or trauma (Larsen 2015). Harvey, Danforth, and Cohen (2017) found that bilateral periosteal reactions of long bones were uncommon at Tipu, appearing on less than 0.1 percent of observable bones, but still more common than trauma. The periosteal lesions were most commonly found on the tibia (8.4 percent, 59/704) and the humerus (5.5 percent, 33/601) (Harvey, Danforth, and Cohen 2017). Most reactions were mild, except for two severe reactions. Complete male skeletons had a higher rate of periostitis, 22.6 percent (36/159 males), while complete female skeletons had a rate of 13.8 percent (16/116) (Harvey, Danforth, and Cohen 2017). Only four out of 182 subadult bones exhibited periostitis. Systemic infections could only be identified on 4.2 percent (19/457) of Tipu individuals. Other patterns from lesions on the bones suggest that Tipu residents did not deal with treponemal disease or tuberculosis-related infections (Harvey, Danforth, and Cohen 2017). Periosteal analyses further support the general relatively good health of the Tipu population.

Skeletal trauma. Harvey, Danforth, and Cohen (2017) examined 457 Tipu skeletons for trauma and found that trauma appeared in less than 2 percent of the population. The areas most affected were the tibiae (1.8 percent of adult bones), followed by the fibulae (1.1 percent of adult bones) and the humeri (0.2 percent of adult bones). Subadult long bones only showed trauma on the tibiae (0.4 percent of subadult bones) (Harvey, Danforth, and Cohen 2017). Trauma assessment on complete skeletons (n=275) revealed some sort of traumatic injury on 8.7 percent of adults, 6.9 percent of adult females (8/116), and 10.4 percent of adult males (16/154) (Harvey, Danforth, and Cohen 2017). Three cases of interpersonal violence were observed (zygomatic, cranium, and tibia) and all three showed signs of healing.

Harvey, Danforth, and Cohen (2017) suggest that overall Tipu residents likely experienced intermittent interpersonal violence and little to none of the violence related to European contact. There is little evidence to suggest that Tipu residents experienced injuries from Spanish weaponry (Harvey, Danforth, and Cohen 2017). Therefore, low levels of trauma may suggest that Tipu did not experience the Spanish violence and warfare that plagued this region during the contact period.

Discussion

Harvey, Danforth, and Cohen (2017) set forth to understand the impact, or lack thereof, of Spanish contact on the Tipu Maya. The contact period in the Yucatán Peninsula was a time for great social and cultural change. Harvey, Danforth, and Cohen (2017) suggest that Tipu's location on the border of the Spanish frontier offered them more freedom to negotiate with Spanish influence and maintain a traditional, stress-free life. Archaeological evidence reveals that Tipuans maintained their Mayan kinship systems, social structures, subsistence style, and economic trade routes throughout contact (Harvey, Danforth, and Cohen 2017).

Bioarchaeological evidence of low rates of biological stress, trauma, and infectious disease further supports the notion that Tipuans were able to peacefully coexist with the Spanish and adapt to changes in the region. Colonial Tipu represents a unique Mayan experience in the Yucatán Peninsula. In this regard, it only subtly experienced the negative biological impacts of European interaction.

Moche of Mórrope, Peru

Hypotheses

The last study I will review is set in Mórrope, Peru, located in the Northwest margin of the Lambayeque Valley Complex on the north coast of Peru (Klaus 2008; Klaus and Tam 2009). This is a bioarchaeological study of a colonial-era settlement in which the Indigenous population lived in close contact with Spaniards. Klaus and Tam (2009) compared precontact and postcontact Native Mórropano populations to discern patterns of biological stress. They hypothesized that systemic biological stress would increase in the postcontact population. Specifically, postcontact changes in lifeways will be observable in elevated prevalence of porotic hyperostosis and linear enamel hypoplasia, lowered subadult growth velocity, and shorter average adult stature in subadults. Meanwhile, postcontact adults will display heightened biological stress through decreased female fertility and increased presence of periosteal reaction (Klaus and Tam 2009).

Region Background

The Lambayeque Valley Complex was once an influential and interconnected region of pre-Hispanic cultures (Klaus 2008; Klaus and Tam 2009). From AD 550-750, this region was the center of the Moche state. Later on, the region would be the center of Sicán society, which functioned at its highest politically, culturally, and economically during the Middle Sicán phase

(AD 900-1150) (Klaus and Tam 2009). The Chimú Empire eventually overtook the Late Sicán society around AD 1375. Approximately 100 years later, the Inka took control over the Lambayeque Valley Complex (Klaus and Tam 2009). When the Inka and Chimú empires ruled the valley, it is estimated that daily life was probably not altered, but the empires did co-opt local economies and political systems (Klaus 2008). Most of the late pre-Hispanic population of the Lambayeque region is presumed to be ethnically Mochica due to the persistence of Moche material culture, ritual, technology, and language remaining long after the fall of the Moche organization (Klaus 2008; Klaus and Tam 2009).

Initial contact with the Spanish in the Lambayeque region took place in 1532 and there were minimal consequences for the Natives (Klaus 2008; Klaus and Tam 2009). Around 1536 Mórrope was established as a *reducción* (Klaus and Tam 2009). It had a highly condensed population in an area with frequent water shortages. Mórrope and surrounding communities often fought over access to nearby resources. The Spanish took control of the surrounding canals, leaving the inhabitants of the area without drinking and irrigation water (Klaus and Tam 2009). Despite these setbacks, Mórropanos actively participated in mercantile exchange networks, collected marine resources, were pastoralists, and mined at nearby gypsum and salt deposits (Klaus and Tam 2009).

During the 1590s, the Spanish administrators fully embedded themselves into the region (Klaus 2008; Klaus and Tam 2009). The Spanish implemented social, religious, political, and ecological changes. The long-established Mochica social organization system, *parcialidad*, which emphasized socioeconomic reciprocity and collectivism, was uprooted (Klaus 2008). Many pre-Hispanic communities throughout the region were forced to resettle into *reducciónes*,

or colonial towns. This region avoided large demographic collapse because of its large Native population and potential economic opportunities (Klaus and Tam 2009).

Sample information

Excavations for this study took place at the Chapel of San Pedro de Mórrope, which operated from 1536 to 1751 (Klaus and Tam 2009). Burials from this site were categorized into Early/Middle Colonial or Middle/Late Colonial, and 459 of the most complete individuals were included in the research comparisons. The individuals from this site are estimated to be of low socioeconomic status and biologically Mochica (Klaus and Tam 2009). The late pre-Hispanic Lambayeque sample consisted of 272 individuals sampled from sites across the valley dating between AD 900-1532 to provide a representative sample of Sicán era diversity, both cultural and biological (Klaus and Tam 2009). Evidence of social organization, subsistence, and low social rank suggests that 94% of the late pre-Hispanic sample is ethnically Mochica. This also suggests biocultural continuation between the precontact and postcontact samples in this study (Klaus and Tam 2009).

Methods and Results

Klaus and Tam (2009) tested their hypothesis of increased systemic stress in the postcontact Mórrope population using four skeletal/biological indicators of stress in subadults and two indicators of stress in adults. Then, they used the odds ratio method to compare the prevalence of the stress indicators between Yucatán populations and temporal periods (Klaus 2008; Klaus and Tam 2009).

Subadult stress indicators. The subadult stress indicators Klaus and Tam (2009) assessed are linear enamel hypoplasia (LEH), porotic hyperostosis, growth velocity, and terminal adult stature.

Linear enamel hypoplasia. Klaus and Tam (2009) used 169 late pre-Hispanic and 147 postcontact dentitions, with completed pairs, to compare for LEH frequency. They found that the frequency of LEH significantly decreased in the postcontact population and is 1.8 times less prevalent in the postcontact Moche population. LEH in the Mórrope individuals continued to decrease in frequency across the Early/Middle and Middle/Late Colonial period. This was an unexpected result for the researchers (Klaus and Tam 2009).

Porotic hyperostosis. Klaus and Tam (2009) compared 172 late pre-Hispanic and 311 postcontact crania with at least 50% complete orbits and cranial vaults for cribra orbitalia and vault hyperostosis. They identified a significant 1.54 times increase in porotic hyperostosis from the late pre-Hispanic baseline to the postcontact Moche sample. The increase in porotic hyperostosis takes place during the Middle/Late Colonial phase (Klaus and Tam 2009). An increase in iron deficiency anemia can be indicative of the poorer living conditions that come with aggregation, such as parasites, rodents, contaminated water, and more, which could cause gastrointestinal infection and reduce iron available in the body (Klaus and Tam 2009). Or it could be indicative of a change in their diet which reduced their bioavailability of iron. Either way, these results point to a decrease in health post-European contact.

Growth velocity. Growth velocity was determined using the maximum femoral diaphyseal lengths of 35 pre-Hispanic and 58 postcontact subadult (ages 0-12) femurs (Klaus and Tam 2009). They found a significant difference between the subadult growth curves of the late pre-Hispanic and postcontact populations. Their data showed that postcontact two-year-olds were growing less than one millimeter faster than their late pre-Hispanic counterparts (Klaus and Tam 2009). Then, from ages five to twelve the postcontact population shows slower femoral growth, between three to four millimeters slower, compared to the late pre-Hispanic population.

Klaus and Tam (2009) acknowledge that slowed growth velocity can be multicausal. However, given the specific time span of growth rate depression in the Moche children, the researchers suggest that it could be the result of gastrointestinal infection resulting from weaning and subsequent introduction to contaminated solid foods (Klaus and Tam 2009).

Terminal adult stature. Terminal adult stature was ascertained from male and female subsamples, including 25 late pre-Hispanic males, 29 late pre-Hispanic females, 59 postcontact males, and 29 postcontact females (Klaus and Tam 2009). Late pre-Hispanic male stature averaged 158.48 cm and postcontact male stature averaged 157.56 cm. The average female height of the late pre-Hispanic population was 151.28 cm, and the average height of postcontact females was 147.95 cm (Klaus and Tam 2009). Although stature levels appear to have decreased from one temporal period to another, the difference lays within the error ranges of stature estimations. Therefore, there is no significant change in terminal adult stature. This was a surprising result for the researchers, and they posit that stress events may have occurred very early in life or it may not have been severe or long enough to disrupt growth and development (Klaus and Tam 2009).

Adult stress indicators. Klaus and Tam (2009) assessed the adult remains for nonspecific periosteal infections and female fertility.

Periosteal Reaction. 55 late pre-Hispanic and 67 postcontact adults were used to estimate the prevalence of nonspecific periosteal infection (Klaus and Tam 2009). Data trends showed a highly significant increase in cases of periosteal reactions in the postcontact sample. They found that periosteal reactions were 4.71 times more likely in postcontact Moche adults (Klaus and Tam 2009). The increase in frequency starts in the Early/Middle Colonial period when the odds become 6.67 times more likely to be infected compared to the late pre-Hispanic population.

Using the historical record, Klaus and Tam (2009) identify the increase in periosteal reactions as owing to consumption of less diverse diets, increased social stress, increased aggregation, and an overall decline in population wellbeing.

Female Fertility. Klaus and Tam (2009) observed a drop in Moche female fertility from 0.4397 during the late pre-historic period to 0.6028 during the postcontact period. They believe this to be a consequence of the establishment of the *reducción* in Mórrope, poor-quality diets, and increased periosteal reaction (Klaus and Tam 2009). Historical records indicate the workloads of women increased inside and around the *reducción* a significant amount leaving them with little energy for reproduction. This is supported by Klaus (2008) in which his study of female articular joints in the Mórrope population revealed that almost every joint had signs of degenerative joint disease.

Discussion

Overall, Klaus and Tam (2009) found a general increase in biological stress from the late pre-Hispanic to the postcontact periods. Four out of the six variables of systemic stress examined showed an increase in stress postcontact, namely slowed subadult growth velocity, increased porotic hypostasis, increased adult periosteal reactions, and reduced adult female fertility. Population aggregation likely contributes to the decline in health because it would have increased adult and child interactions with viruses, parasites, contaminated water, domesticated animals, rodents, dogs, and diseases, such as smallpox, scarlet fever, mumps, measles, and influenza (Klaus and Tam 2009). They believe that agricultural practices changed during the colonial period and Mórropanos lost access to many nearby resources. Moche diet changed to rely heavily on maize and beans with little meat, but they could have also relied on more seafood. Either way, their change in diet would have negatively impacted their health and led to

malnutrition, especially at a young age (Klaus and Tam 2009). The researchers conclude that life in Colonial Mórrope must have been a stressful existence. Although they were active in the political economy at the time, Mórropanos never experienced the benefits of their labor. In concluding their study Klaus and Tam (2009) accepted their hypothesis that postcontact systemic biological stress increased in Mórrope, Peru. This study builds on the body of research that supports the notion that European contact deteriorated Indigenous health and lifeways in the Lambayeque region.

DISCUSSION

The Guale, Tipu Maya, and the Moche all reflect very different experiences of Native-European contact, even though they all interacted with the Spanish. The Georgia Bight Natives' experience with the Spanish was shaped by the established mission sites and the *repartimiento* labor system (Larsen et al. 2001; Larsen et al. 2002). The experience of the Moche in Peru was influenced by the creation of the *reducción* (Klaus and Tam 2009). The Tipu Maya were advantaged by their geographical location in the Spanish borderlands (Harvey, Danforth, and Cohen 2017). The conditions of their experience shaped their shift in lifestyle, both the negative and neutral aspects. They reflect not only the individual physiological change but the cultural and societal change that came with Spanish domination and exploitative strategies.

It is apparent that the main commonality that these three Indigenous groups shared is that they interacted with the Spanish, but this didn't determine the quality of the interaction that took place. The Tipu Maya displayed limited physiological impact from contact, but they exhibit some cultural change as a result of Spanish influences (Harvey, Danforth, and Cohen 2017). Both the Guale and Moche experienced the negative physiological consequences of contact, as well as cultural and religious transformation (Larsen et al. 2001; Larsen et al. 2002; Klaus and

Tam 2009). Comparisons with other sites that interacted with the Spanish and have some similarities with the Guale, Tipu, and Moche, still reveal inconsistent patterns of contact impact.

A contact study completed at Tatham Mound, located on the Gulf coast of Florida, found little impact resulting from Spanish contact other than there was evidence of sharp-force trauma resulting from intergroup hostility (Hutchinson and Norr 2006). Tatham Mound is located close to the Georgia Bight region. Early Spanish contact occurred at the same time in both locations, but they exhibit different experiences of contact. Another study done on the Spanish borderlands of Texas revealed more severe biological impacts of contact even with short durations of interaction (Miller 1996). Whereas, in the borderlands of Central America, Tipu had little biological impact resulting from contact (Harvey, Danforth, and Cohen 2017). These other case studies exemplify the variation in response to contact even with some of the same conditions.

CONCLUSION

At the beginning of this thesis, I set out to find a commonality that could predict the level and success of Spanish contact on Native populations. In my research, I was unable to identify a singular commonality that could predict the outcome of Spanish contact and colonization in the Western Hemisphere. Given the current state of contact research, there is limited evidence to suggest that only one variable determined the outcome of Native-Spanish contact. Instead, the contact experience is likely the result of a variety of variables acting in a specific context. This is why we see a wide variety of levels of biological impact in the skeletal remains of contact era Native populations. Therefore, the analysis and interpretation of the impact of contact on Native Americans should be taken on a case-by-case basis owing to the presence of many confounding variables for researchers to tease apart.

Some of the variables I considered in my research were the Native community's accessibility or proximity to the ocean, the duration and intensity of intercultural interaction, the availability of local resources that may be in high demand, and the specific conquistador or explorer interacting with the Native group. I realized that in conjunction with these aforementioned conditions, the deterioration of Native American health postcontact is linked to the health status of the population precontact.

Prior to European arrival, North and South American Native communities were evolving and adapting each on their own timeline and their own context generally. The adoption of agriculture and the development of complex societies had an impact on Native life all on its own. In many cases, the bioarchaeological record is limited in being able to fully represent what past populations looked like. Studies such as Larsen et al. (2001) are fortunate to have such a rich historical and bioarchaeological record that covers a deep time span. Without knowledge of the history of lifestyle and health in a specific setting, it is difficult to determine if changes in health and wellbeing postcontact are continuations of precontact transformations. Precontact transformations can include diet change, subsistence strategy change, aggregation, sedentism, or cultural change. Therefore, contact studies, such as this one, are limited by the availability of the bioarchaeological record.

One of the main goals of bioarchaeology is to reconstruct the lives of past populations by analyzing their biological remains in the archaeological context. When we use bioarchaeology to study contact we have to ask, "why did this reaction to foreign interaction take place?" This prying question can help us understand modern human interactions. In a world of increasing globalization, with the help of the internet and fast transportation, many parts of the world are engaging with each other in ways never before possible. It is becoming increasingly important to

understand how our surroundings, international interactions, and cultural constructs are influencing our health. Understanding the negative impact that unprecedented interactions had on past populations can help us prevent the same thing from happening today.

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