Unfortunate frontiers: patterns of skeletal trauma in the Colorado State Hospital 1879-1898

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Abstract

This project explores trauma patterning in an institutionalized population from a late 19th-century state asylum in Colorado. The results are compared to contemporaneous skeletal assemblages and interpreted through the poetics of violence. A sample of 40 individuals from the skeletal assemblage associated with Cemetery 2 (1879-1898) of the Colorado State Hospital were assessed for traumatic injury. Fractures were documented by location, type, degree of healing, and descriptive measurements. Demographic distributions of trauma and analyses of injuries by body area demonstrate to what extent different cohorts of individuals presented with differential risks regarding traumatic injury. Of the 40 adult individuals assessed, 27 (67.5%) exhibited at least one fracture. Over half of these individuals (55%) exhibited more than one fracture. The most common fracture site was the ribs, with 18 individuals (66% of those with fractures) displaying one or more rib fractures. Amongst this sample, 44% females exhibited fractures in comparison to 74% of males. Nine individuals exhibited multiple fractures at varying stages of healing, suggesting injury recidivism. The extensive trauma in this sample fits patterns of occupational injuries and interpersonal violence, signifying the hazards of mining, farming, and institutionalization that these individuals faced. Trauma frequencies are significantly higher in this population than other contemporary institutional contexts, potentially reflecting unique intersections of gendered divisions of labor, violence, and institutional practices on the American western frontier.

DEDICATION

To the late Dr. Ann Magennis, who spent the better part of her career working to recover the stories of these forgotten individuals. You are missed dearly.

Acknowledgements

Firstly, I am deeply grateful for the opportunity to learn from the individuals included in this study. I also wish to extend my gratitude to my committee members Dr. Lauren Hosek, Dr. Steven Leigh, and Dr. Hillary Potter. A million thank-yous to Dr. Hosek for leading me toward every opportunity to pursue my interests, and supporting me not just as a mentor but also as a human. The commitment you demonstrate toward your students and the individuals you study reflects your immensely generous and compassionate character. I am deeply grateful to have had the opportunity to begin my academic journey with bioarchaeology under your guidance. To Dr. Leigh, thank you for reassuring me by reminding me of my 'humanness' when life got hectic and turbulent. I would have not survived this process without either of your leadership, encouragement, and support, both academically and personally. To Dr. Potter, I thank you for hopping onto my committee and taking on my project, despite not knowing me very well and with little notice.

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Chapter 1

Introduction

According to the World Health Organization, unintentional and violence-based injuries constitute nearly 8% of deaths each year, and trauma is the leading cause of death worldwide (2022). Causes range from traffic accidents and acts of violence to falls. Exposure to trauma (physical or psychological) can increase an individual's risk of developing mental illness, substance abuse disorder, and chronic diseases (Krug 2000, World Health Organization 2022). Although injuries are a large burden on health worldwide, approximately 90% of injury-related deaths are reported from middle to low-income countries. However, even within "developed" countries, certain cohorts of individuals are at higher risk of exposure to injurious conditions. Risk factors include poverty, economic and gender inequality, and the living and working conditions of a particular individual (World Health Organization, 2022). Injuries may also result in physical deformation or disability, initiating long term effects on health and potentially one's socioeconomic status.

The level of traumatic injuries in a population can reveal their human and economic impact. Violence-based injuries invoke questions surrounding the circumstances of conflict, and occupational or activity-related injuries can reveal the conditions of labor and daily activity. Bioarchaeology is uniquely situated to use the skeletal body as the center at which to consider the large-scale social or historical realities that shaped the lived experiences of the deceased. Given the immense physical and psychological impacts that traumatic injuries have on lived experience and morbidity and mortality outcomes, they are of particular interest in considering the well-being of individuals and populations in the past.

1.1 Topic of Study

Evidence of traumatic injury amongst human skeletal remains can provide direct insight into the conditions of life and occurrences of violence in the past. Historic institutionalized populations have become the subject of considerable research into direct and indirect forms of violence (Klaus 2014, Martin, Harrod, & Perez 2012, Tremblay et al. 2020). This thesis explores injury and trauma patterning within a sample of individuals from an institutionalized setting in the American Mountain West. Skeletal indications of trauma can provide a valuable complement to the often-incomplete archival records for these types of facilities, helping researchers to construct narratives that may have otherwise been lost to time (Atwell 2022, Zuckerman et al 2014). The goal of this project is to develop a greater understanding of the physical hazards of industrial transitions and institutionalization within the context of the Colorado State Hospital. I will demonstrate whether and to what extent different cohorts of individuals of this population may have presented with varying episodes of traumatic injury, potentially as a result of structural violence. This analysis will allow us insight into the lived experiences of impoverished and institutionalized individuals during the industrialization of the American West.

1.2 Problem Statement and Rationale

Historical documentation such as institutional archives, newspaper articles, government decree, and evidence from judicial proceedings do provide some insight into the lived experiences and conditions faced by individuals in the 19th century, especially as the overwhelming need for state supported institutions grew. Magennis and Lacy (2014) analyzed the admission records associated with the Colorado State Hospital (CSH) between the years 1879 to 1900, and compared the results to US Census data. They found that approximately 42% of individuals admitted into the

asylum died there, ultimately reporting patterns of marginalization with respect to risk of admission. Although archival evidence supports an analysis of social contextualization through historical data, there are no existing biographical records associated with the individuals interred in unmarked graves at “Cemetery 2” of the Colorado State Hospital.

With a focus on poverty and marginalization in the past, bioarchaeological studies of industrialization in America have been carried out on skeletal assemblages associated with 19th-century institutions of care (Tremblay, 2020). These include poorhouses, asylums, state hospitals, and sanatoria. Although previous analyses have recorded the prevalence of trauma in a particular context using similar theoretical approaches (Atwell 2022, James 2023a, Leavitt-Reynolds 2011, Tremblay 2017), no investigations specifically focusing on the CSH sample have combined documentary, archival, historical, and osteological analysis to interpret trauma and injury patterning through the “Poetics of Violence” model. This biocultural approach enmeshes violence theory with supporting biological data, making use of historical and documentary archival contextualization through broader social theories. By examining the social and cultural realities faced by patients prior to institutionalization, a multi-level systematic analysis allows for the consideration of the lived experiences of the individuals included in this study.

Zuckerman et al (2014) seek to justify bioarchaeological studies through a relational ethical perspective by elucidating the nature of studying the marginalized. By attending to the life histories of individuals whose experiences may not have been aptly reflected in recorded history, they “enable [the] recovery and recognition of the agency, singularity, and meaning of past peoples through giving voice to their narratives" (2014: pg 516). In the context of CSH, there is an ongoing initiative to establish a stakeholder community. In the context of the Mississippi State Asylum,

press coverage on the Asylum Hill project revealed the descendants of family members who had been institutionalized.

Taking the relational ethics of meaning approach, this study seeks to explore the populational level incidences and patterns of trauma and their manifestation on the skeleton to consider the kinds of hazards that individuals endured prior to and during institutionalization. Research questions are multiscalar, ranging from the individual to the larger skeletal series, and considered demographically in social, economic, and historic contexts.

The distribution of trauma will be assessed through differentiating the presence and etiology of injuries between and amongst different cohorts of individuals. By considering multiple axes of identity such as age and sex, it will be possible to consider the kinds of social factors that introduce higher levels of risk and exposure in a given person's lifetime. The individuals included in this study have life histories that extend many years prior to institutionalization. In what follows, I explore the ways in which structural violence may have contributed to higher levels of exposure to hazardous occupational conditions and instances of interpersonal violence for these individuals.

1.3 Materials

In 1992, the remains of 131 individuals associated with Cemetery 2 of CSH were disinterred as result of the development of the San Carlos Correctional Facility in Pueblo, CO. After a GIS study completed in 1998, additional graves were identified and excavated by a team of contracted archaeologists (Painter 2002). Today, the remains of at least 155 individuals are housed in the Department of Anthropology and Geography at Colorado State University in Fort Collins, CO. For this study, a subsample of 40 individuals were analyzed by a team of researchers, including myself, using standard techniques (Buikstra and Ubelaker 1994). We completed

estimations of skeletal age and sex and described, photographed, and illustrated trauma and other pathologies. Each lesion was documented by location, type, state (antemortem or perimortem), degree of healing (none, actively healing, well healed) and descriptive measurements.

Imperative to biocultural studies of injury and trauma are the social and historical data, which in this study consist of mortuary artifacts, historical documentation, and an archaeological site report. A socioepidemiologcial study on the admissions, death, medical and financial records carried out by Magennis & Lacy informs the social aspects of morbidity and mortality within the asylum and in the state of Colorado. Letters from visitors of the asylum and articles in local newspapers serve as anecdotal evidence taken to represent the experiences of contemporary individuals.

1.4 Research Questions and Hypotheses

The overarching research questions in this study are: 1) Whether and to what extent are different cohorts of individuals of this sample at risk for varying types and instances of traumatic injuries? 2) Is it possible to determine the proximate and behavioral causes of these injuries? 3) How might the patterns and prevalence of injury on the individual and populational level reflect the hazards of interpersonal and systemic violence? The interpretation of the trauma pattern analysis in the context of CSH is best interpreted within the framework of poetics of violence. The multiplicity of factors related to admission risk reflect intersecting vulnerabilities in the social characterization of the ‘insane’. Taken with the previous research into the political economy of asylum institutions in 19th century America, I propose that individuals in the sample associated with CSH will present with significantly higher levels of traumatic injury than those of eastern institutions.

1.5 Impact

This preliminary study into the CSH Cemetery 2 sample adds to our understanding of American industrial transitions in the mountain west, the effects of the asylum institutional model, and structural violence in the late 19th century in Colorado. This project not only provides information about an underexplored institutionalized population, but is also a point of reference for comparison with similar or contextually different 19th-century populations. The analysis and interpretation of these skeletal remains has the potential to reveal otherwise hidden narratives about the industrial era, and demonstrate the hazards encountered in this institutional context situated in a rapidly developing frontier society.

1.6 Organization

In the following chapter, I detail the current theoretical pathways in bioarchaeology and situate the context of this thesis in the "Poetics of Violence" model. Chapter 3 is dedicated to detailing the social and historical context of westward expansion, and the following transition from frontier society to industrial center. To effectively situate the institutional processing of patients to the Colorado State Hospital, the historical investigation of 19th-century newspapers, medical journals, diaries, and memoirs provides important experiential social commentary. Including contemporary medical perceptions will also allow for a greater understanding of differential vulnerabilities contributing to admission, and the logics that dictated the pathologizing of mental illness.

Chapter 4 will detail the bioarchaeological methods employed in data collection and analysis, and the materials used for this study. This includes the site report of the population,

methods for age-at-death and skeletal sex estimation, traumatic injury response, fracture mechanics, and approximation of biomechanical causes.In Chapter 5, I present the results of the demographic patterns of injury. The prevalence of traumatic lesions are compared to those found in the Oneida County Asylum of New York (1860-1895) and the Milwaukee County Asylum (1880-1950s). Injuries are then grouped by cohorts consisting of age, sex, and injured element. Paleoepidemiological and clinical literature are used in order to infer each injury's potential biomechanical cause. I also utilize an osteobiography of an older adult male in order to strengthen a micro- and macro-historical interpretation of injury experience in the context of CSH on the individual and group levels.

Chapter 6 engages in a discussion of the trauma patterns observed through multiple lines of evidence. Building on the results, patterns are deeply contextualized with all of the available historical, social, clinical, and archaeological material. The financial and organizational factors in labor conditions and the economic ramifications of these larger governing structures lead to highly dangerous conditions in the early industrial complexes of Colorado. As elsewhere in the country, state support was required in order to provide care for vulnerable individuals. Integrating the skeletal data with the biological, sociological, and historical data allows for the integration of these two levels of analysis on an individual, group, and community level. Finally, I offer some concluding remarks and future research directions in Chapter 7.

Chapter 2: THEORETICAL FRAMEWORKS IN BIOARCHAEOLOGICAL TRAUMA STUDIES

2.1 Introduction

Bioarchaeology is the scientific study of human remains from archaeological sites. It integrates a biocultural approach to the reconstruction of past people's lived experiences (Buikstra 1977, Zuckerman & Armelagos 2011). Bioarchaeological studies of 19th century institutions are well positioned to consider issues of industrial-era inequality and their relation to contemporary issues of poverty, gender inequality, and social injustice (Armelagos & Van Gerven 2003, Farmer 2004, Tremblay 2017). In this section, I begin with the development of the field within "physical" anthropology and discuss the current ethical issues surrounding the nature of research on human remains. Then, I introduce paleopathology as the subdiscipline through which injury and trauma studies are implemented. I approach this trauma analysis through the biocultural lens drawing on the poetics of violence model and structural violence theory in a bioarchaeological framework. In this chapter, I first detail the biocultural approach as it is employed in bioarchaeology to explore the relational interactions between the human body and its cultural, social, and environmental entanglements. In the following section, I provide further background on the philosophical foundations of embodiment, identity, and intersectionality, which accommodate approaches to explore an individual's lived experience and the process of identity formation.

Bioarchaeology in historical context

In the 1950's and 1960's, the processualist movement and the "new physical anthropology" developed out of an insistence to marry anthropology with archaeological method and theory. Prior to this paradigmatic shift, approaches to archaeological sites and associated human remains were analytically divorced from one another. Skeletal and material remains were used as a means to describe and typify people and places. The shift toward processualism reoriented the empirical

study of archaeological material through the hypothetico-deductive method, and held that differences amongst cultures occurred within a predictable framework.

As it became apparent that purely "objective" generalizations about culture were grounded in and shaped by adaptationist ideas of hereditarianism and social darwinism, post-processualists called for a repositioning in response to processual approaches that were grounded in ethnic prejudices (Zuckerman & Armelagos 2011). Post-processual archaeology aimed to critique the processual movement and attend to the ways that archaeological interpretations contribute to problems experienced in contemporary society, such as health disparities, inequality, and structural racism (Armelagos & Van Gerven 2003).

Today, many bioarchaeological projects are oriented towards addressing social inequality and injustice in the past, to consider how structures like racism and wealth inequality affect the health and wellbeing of contemporary individuals. By incorporating transdisciplinary theory and methodology, the 21st century approaches in bioarchaeology work outward from the body toward aspects of identity such as gender, social age, and ethnicity. Individuating characteristics such as age-at-death, skeletal sex estimation, and presence of skeletal lesions are recorded in population-level data sets to consider the impacts of climate change on human health, behavior, occurrences of violence, migration, adaptation, and diet. The methods and hypotheses tested are derived from subfields in biological anthropology, sociology, and archaeology. Biological data is richly contextualized through incorporating ecological, ethnographic, sociological, and historical analyses. Aside from deriving information solely from macroscopic observations of skeletal remains, the scope of techniques have broadened to include geospatial analysis, microscopy, medical imaging, molecular and chemical analysis (Baker & Agarwal, 2017). Emerging patterns

give insight into past epidemics and pandemics, the mechanisms of health inequality, as well as human adaptation and plasticity (Buikstra et al., 2022).

The analytic capacity of bioarchaeological research has resulted in the ability to advance modern understandings of the processes of urbanization, inequality, political and economic systems, conflict, religious ideology, cultural exchange, and otherwise unidentified or unexplored aspects of life in the past. By synthesizing biological data with theoretical approaches that accompany social, cultural, and historic contextualization, bioarchaeologists can consider aspects of social identity, such as: gender, age, socially defined race, disability, religion, and ethnic or community identity. Multiple axes of identity may be reflected on the micro and macro scale, through individual osteobiographies and population demographics (Knudson & Stojanowski 2020, Hosek & Robb 2019).

Contributing widely to the field of bioarchaeology, paleopathology is the interdisciplinary study of disease in the past (Buikstra 2017, Buikstra & Dewitte, 2022). Paleopathologists incorporate methods from biological anthropology, as well as the biomedical and social sciences. Through skeletal remains, they can identify evidence of infectious disease, physical injury (trauma), bacterial infections, fungal infections, parasitic infections, metabolic and endocrine disturbances, congenital pathologies, joint diseases, and tumors.

Trauma is one of the most commonly observed pathological conditions amongst skeletal remains (Lovell 1997). Evidence of traumatic injury can provide paleopathologists with information about individual or population-level interaction with the physical environment, through the interpretation of the potential social, cultural, and environmental causes of traumatic injury (Peréz 2022, Redfern 2017). Examining the causes of trauma and their potential relationship to patterns amongst different cohorts of individuals in a given population may indicate social or

cultural relevance within that community, or reflect temporal and geographic patterning across populations (Harrod & Osterholtz 2022, Redfern & Roberts 2019).

Current Issues

Ethical concerns in bioarchaeology are still being addressed in order to continue to recognize and define the inherent biases that stem from its legacy in colonial projects (Buikstra et al, 2022). Not only has the history of bioarchaeology come under the purview of ethical reconsiderations, but the methods and the skeletal collections which have been used to inform them are entrenched in contexts of structural racism and inequality, particularly collections composed of the remains of individuals that were illegitimately and unethically provenanced (de la Cova 2022, Nystrom 2014). Science, and the creation, communication, and implementation of knowledge are products of a socially and culturally mediated discourse enacted by inherently subjective beings. The subjective nature of any empirical study, including that of anthropological research, requires us to recognize our own social identities and positionalities of privilege in our research projects and academic endeavors (Blakey 2023, de la Cova 2022). Parsing out the ways that structural racism and inequality pervades research design, addressing the lack of presence of bipoc individuals and researchers in the field, the marginalized and minority status of individuals making up research collections, and implicit biases in hypothesis testing have been the subject of a considerable amount of research (Blakey 2023, de la Cova 2022, Zuckerman & Kamnikar 2014).

In the United States specifically, major criticisms within the field paired with public outcry of Native American descendant communities resulted in legislation for the ethical treatment and repatriation of stolen cultural material and human remains. In 1990, the Native American Graves Protection and Repatriation Act [NAGPRA] was introduced to outline and regulate a process for

the repatriation of cultural material to federally recognized tribal organizations. Today, revisions are continuously made to place indigenous rights and sovereignty at the forefront of decision-making processes with regard to curation, research design, destructive sampling, data sharing, and the implementation of research projects (Bader et al. 2023). This legislation was revised most recently in December of 2023, placing informed consent as an essential requirement and changing the language of the regulations to facilitate accessible repatriation processes (Department of the Interior, 2023).

Many researchers have drawn attention to the legal and organizational obstacles to adequately address those minority communities whose ancestors' remains were also illegitimately excavated and curated for anthropological research in the United States, specifically (Bader 2023, Blakey 2023, de la Cova 2023). News of public archaeology projects like the New York African Burial Grounds and the negligence associated with the curation of individuals' remains associated with the 1985 MOVE bombing have indicated a serious need to address the wholesale legal protections of vulnerable descendant communities. On December 29th, 2022, the United States Congress officially ratified the African American Burial Ground Preservation Act into law. This served to authorize the National Parks System to preserve "previously abandoned, underserved, and other African-American burial grounds." (African American Burial Grounds Protection Act, 2023).

The fundamental issue of negotiating institutional rights to scientific advancement and research over those of living and deceased populations is a goal of contemporary bioarchaeological research and theoretical sophistication (Bader et al., 2023). Bioarchaeologists continue to grapple with these issues as we look toward the future. Bioculturally framed approaches better position us

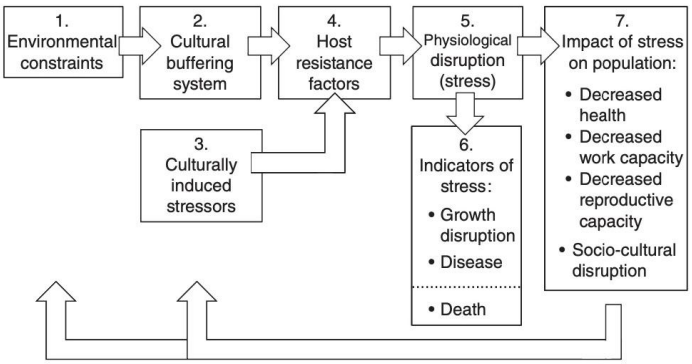
to attend to the realities of research on human remains and address culturally sensitive contextual analyses involving communities with deep histories of marginalization and exploitation.

2.2 Biocultural Approaches in Bioarchaeology

The biocultural approach to anthropological research emerged through an attempt to better contextualize the complexities of human health and adaptation, emphasizing the relationship between human biology, culture, and the environment (Zuckerman & Armelagos 2011, Zuckerman & Martin 2016). The objective has broadened to include the impacts of power relations and social inequality on human biology and paleopathology, with interests in identifying and describing the social determinants of health (Armelagos & Van Gerven, 2003). Thus, bioarchaeological analyses of human health in past populations are well positioned to inform the spatial and temporal dimensions in which modern issues are historically embedded. The biocultural model (Figure 2.1) links demographic, biological, and cultural processes within an ecological context in order to investigate social phenomena such as violence, crime, racism, economics, urbanization, industrialization, and ultimately the mechanisms of social inequality.

The human body is capable of orchestrating physiological responses to environmental stressors in both positive and maladaptive ways (Zuckerman & Martin 2016). These adaptive responses can reflect disturbances on the individual level such as undernutrition, disease, injury,

Figure 2.1: A schematic representing the biological, cultural, and environmental interactions, taken from pg 12 of 'New Directions in Biocultural Anthropology' (Zuckerman & Martin 2016).



or death and are examined on the population level with the capacity to reveal patterns that reflect the dynamic interplay between human biology and the physical environment. The physical environment is considered to be the source of resources integral to survival. If there are environmental constraints on the available resources, cultural buffering systems employed to mitigate their effect (such as technology, institution building, social organization, and group ideology) may inadvertently enhance other culturally induced stressors (such as social stigma, poverty, oppression, and discrimination) can weaken or strengthen the host individual's resistance factors to physiological stress. Any resulting physiological disruption may result in a range of outcomes that can introduce population-level stressors. Bioarchaeologists detect these instances of individual or population-level stresses by analyzing individuals' age-at-death, sex estimation, as well as accompanying evidence of skeletal stressors. When taken together with environmental, archaeological, and historical-archival evidence (if available), this approach has the ability to be more ethnographically valid, exploring multiple causal mechanisms with regard to the disposition of the individuals being studied.

2.3 Embodiment and Identity Formation

Central to the emergence of the biocultural model are perspectives of embodiment, which developed out of phenomenology and the philosophy of human experience. Since their emergence, these perspectives have been adopted in the theoretical sophistication of fields such as anthropology, sociology, history and epidemiology (Foucault 2003 & 2009, Krieger 2005). Historically, the body was treated as distinctly separable from the contents of the mind in conscious experience, resulting in the view that mental phenomena are distinct from the physical aspects of bodies. Embodiment theories frame human bodies as highly complex biological organisms capable of the creation of meaning and identity, "transformed" by entanglements with wider social, physical, and environmental structures. (Knudson & Stojanowski year, Krieger 2005, Sofaer 2006)

One perspective of embodiment relevant to this study is Michel Foucault's theory of biopower. 'Biopower' refers to the capacity for modern nation-states to target the biological features of human bodies in order to exert social control (Foucault 2009, Shilling 2012). In his model of "biopower", the body is a locus of individual experience which is reflective of its entanglements with broader power structures that can aid, enhance, or interfere with the agent's ability to function. Disciplinary, judicial, and social institutions are mechanisms of socio-political control. Foucault proposed that as religious and political institutions began to take up pastoral functions in growing communities, their governance expanded to include responsibility and security over the moral conduct and behavior of its citizens (Foucault, 1978; p 8-10). Social discourses such as the constructs of gender, sexuality, morality, race, and religion lead to the creation of cultural norms. Identities can be constructed, or imposed, through culturally mediated forces such as race, ethnicity, gender, sex, socioeconomic status, disability status, and religious beliefs. Identities can be associated with moral values, and excluded, disciplined, or transformed by social processes (Sofaer 2006).

Social bioarchaeologists are uniquely positioned to address identity formation through the lens of embodiment. Grounded in the biocultural approach, skeletal remains are considered to be tethered biologically and culturally, reflective of their life histories including personal experiences (Zuckerman & Armelagos 2011). Incorporating this perspective allows for the exploration of how the expression of individual human agency and identity formation are transformed by social constructs such as potential sex/gender differences, the biological effects of class structure and hierarchies of power, and poverty.

Osteological sex estimations are used to consider gender identity. Sexed and/or gendered bodies are considered to be combined constructions of social and individual identities, by looking at sex estimations on the individual or population level, researchers explore sex in relation to mortuary analysis, daily activity reconstruction (such as labor), potential divisions in the overall health and disease burden, and the life course (Hollimon 2011). Osteological age estimations allow for the investigation of age-related patterns of development, disease, activity, mobility, and death. Each of these methods are used in order to investigate patterns of pathological lesions such as those exhibited in cases of illness, injury or congenital defects are used to consider life histories, health experiences, identities of inequality and disability. Community identity may also be inferred, by completing biodistance analysis in order to investigate mobility over the life course (Knudson & Stojanowski 2017).

2.4 Structural Violence and Bioarchaeological Theory

It is well documented that the large-scale industrial transformation that occurred in the United States and the political-economic factors around the establishment of social institutions resulted in structural inequalities (Tremblay, 2020). Biocultural trauma analyses are used as a proxy to understand mechanisms of interpersonal violence and impediments to health such as increased exposure to hazardous conditions, resulting in traumatic injury.

The language used to describe and categorize acts of violence has a direct influence over the way its meaning is understood and discussed (Galtung 1964, Pérez 2016, Redfern 2017, Whitehead 2004). Contributions from public health, sociology, medical anthropology, and philosophy have shaped the way violence is investigated and interpreted. Today, the World Health Organization recognizes an ecological model of violence consisting of four overlapping layers: individual, relationship, community, and societal. It defines violence as "the intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment or deprivation" (WHO 2002) "Types" of violence are divided into self-directed, interpersonal, and collective violence. The "nature' of violent acts are divided into physical, sexual, psychological, and those which involve deprivation or neglect. Many of the debates present in anthropological studies of violence have occurred as a result of an inability to form a legitimate consensus on how to identify and explain violent behavior (Whitehead 2004).

The mechanisms, outcomes, and manifestations of 'Social Violence' are of particular interest to studies of violence in anthropology and social bioarchaeology. Social Violence refers to those types of violence which are culturally meaningful and enacted and reproduced through "the normalization of particular forms of violence and widespread cultural sanctions for the use of violence against specific groups or individuals" (Martin et al 2022: pg viii). Neil L. Whitehead's

(2004) work ‘On the Poetics of Violence’ seeks to further an anthropological treatment of violence by grounding its theoretical conceptualization in ecosocial theories of violence and political economy. Because human beings live complex lives entangled with social, cultural, and historical processes, the way violence is enacted, perceived, and experienced by individuals varies. By embedding episodes of violence within the wider historical, political, and economic systems that mediated their outcome, he calls for the careful integration of historical time with evidence from archaeological processes.

Structural Violence

The social theory of Structural Violence was developed by Johan Galtung (1969) in order to explain the interplay between social structure, agency, and the impairment of social, economic, and biological potential of individuals or groups. Rejecting a narrow concept of violence, Galtung argued that Violence “is present when human beings are being influenced so that their actual somatic and mental realizations are below their potential realizations" (Galtung 1969: pg 168). In his view, violence consists of three types: physical, structural, and cultural, each interacting with and supporting one another. Occurrences of violence have different structures, ones with clear perpetrators, victims, and witnesses. Some forms of violence (like social injustice), however, do not have clear actors. Violence can also occur as a result of a highly dynamic influence relation between an influencer (e.g. a social institution), an influencée (a group or individual), and a mode of influencing (the violent action or outcome) (Galtung 1969).

The ‘cause’ of violence in this model is broadened to include the kinds of avoidable harm that are imparted by people as well as institutions. In his typology of violence, he separates violence into “personal” and “structural”. “Personal Violence” can be intentional or unintentional,

physical or psychological, and done with or without the use of objects. “Structural Violence” can be manifest (observable) or latent (silent potential), intentional or unintentional, and done with objects or without objects. Structural Violence is not divorced from, but can influence instances of, personal violence, and is imparted by social institutions that cause the “avoidable impairment of fundamental human needs or . . . the impairment of human life, which lowers the actual degree to which someone is able to meet their needs below that which would otherwise be possible” (1969: pg 170). This model recognizes that many instances of violence may lack clearly identifiable actors and appreciates the presence of cultural practices and their ability to legitimize, enact or sustain violence on the interpersonal, structural and cultural levels (Galtung 1969).

Structural Violence and Bioarchaeology

Bioarchaeological investigations of structural violence are employed within specific contextual circumstances when evidence of structured social inequality (such as increased morbidity load or mortality risk) is produced and sustained in hierarchical societies (Bright 2020). Situating the body in relation to the factors in a given society that restrain individual or community health, this approach permits the consideration of the political-economic structures that govern the conditions under which individuals are forced to live and work (Tremblay 2017). Galtung’s model of structural violence is used as an explanatory framework to investigate the potential driving forces of direct physical violence and health inequalities as evidenced by physiological stress indicators, such as those that occur from injury response, malnutrition, or disease processes (Bright 2020).

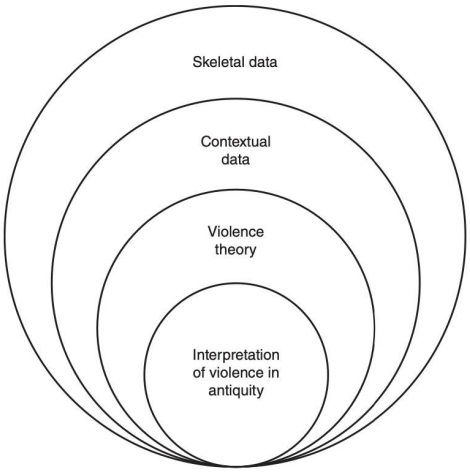
Avenues of research include interpreting direct physical violence as evidenced by traumatic injury as well as health and pathology through evidence of pathological response to disease and

physiological stress. Injury and trauma studies address patterns of prevalence of direct violence among and between groups resulting from structurally violent social and economic systems (Bright 2020). The interpretations rely on richly developed political and economic historical data in order to effectively determine whether or not the application of this concept is appropriate for the population in consideration.

In order to understand structural violence, a careful examination of who is occupying the structure and how it was formed and maintained must be used to support skeletal data. Political economy, taken from social theory, looks at the relationships between individuals, institutions,

Figure 2.2: Diagram for the 'Poetics of Violence Model' in the interpretation of skeletal data - beginning with the interpretation of violence in antiquity. Taken from Perez (2016).

and governments, allowing for the "study of power relations and how they control wealth and resource distribution" (Bright 2020). Pérez (2016) proposes an alternative model for a bioarchaeology of violence specific to integrating social theories (like Galtung's structural



violence) with trauma analysis in a biocultural model (Figure 2.2). In this model, skeletal data must be supported by contextual data in order to situate the violence theory utilized to interpret its occurrence in a particular historical context. Social institutions are considered on the micro and macro scale, by including the greater political-economic relationships that undergird the structure of the society in question. Understanding the political economy of a given population is integral

to consider the ways that migration, conflict, resource scarcity, ethnic identity, and other factors may have affected or been experienced by individuals (Pérez 2016).

2.5 Conclusion

The 'poetics' model of trauma analysis in social bioarchaeology accommodates the myriad difficulties in offering explanations of violence (Pérez 2022). Because occurrences of violence are historically contingent, their analysis must be grounded in any available archival or documentary evidence. Data must be interpreted within a culturally informed context and strengthened by supporting social theory in order to illuminate meaningful patterns that reveal the potential motivations behind violent behaviors and social systems. The patterns of trauma that arise from the sample of individuals in this study will be compared to contextual data in the historical contexts of social and political economic relations.

Chapter III: HISTORICAL BACKGROUND

3.1 Introduction

The latter half of the 19th century initiated a period of rapid social, economic, and demographic change in the United States as westward expansion and industrial transitions continued to alter the social and physical landscape. Following the war of 1812, the federal government began an initiative to expand the geographic borders of the country. This resulted in the acquisition of territory west of the Mississippi River to the Rocky Mountains, and from the Gulf of Mexico to the Canadian border. Influenced by American Exceptionalism and Manifest Destiny (Figure 3), this was seen as a transformational process, legitimizing the Indian Removal Act and drawing settlers to the region, creating communities founded on these ideologies (Gomez 2007, Hine 2017; pg 180, Ostler & Jacoby 2021).

Figure 3.1: 1872, 'American Progress' by John Gast. Courtesy of the Autry Museum of the American West

The "American Frontier" refers to this fundamental period of advancement and consequent development of the geographic and political margin of the United States (Murtazashvili 2013). In this section, I detail the transition between Colorado territory to statehood and the effects that political-economic interactions had on institution building. I then situate the Colorado State

Hospital in this frontier context using documentary evidence from admission records, biennial reports, newspaper articles, and excerpts from judicial proceedings.

3.2 The Herald of Westward Expansion to Colorado 1859-1898

In 1858 and 1859, the Pikes Peak Gold Rush attracted the first swarm of entrepreneurial migrants from the eastern United States to the territory of Colorado in hopes of material fortune in the wake of agricultural failure and bankruptcy (Abbott et al 2013). Mining settlements quickly emerged along the eastern front range of the Rocky Mountains. Many of the early communities failed to establish a systematic form of government due to intra-district disputes on governance and a fluctuating population. This crisis was exacerbated by the eruption of the civil war and the economic effects on the composition of the underdeveloped communities (Abbott et al 2013, Wei 2021).

The conditions of camps and settlements reflected the lack of planning and structure needed to provide basic services to support citizens. Managing only to retain a few existing permanent structures, alongside the inability to provide the associated costs for their construction, there were no institutions such as schools, hospitals, jails, law enforcement, or a specific government to mitigate community level issues like sanitation. Characteristic of modern depictions of the 'Wild West', these mining towns experienced high levels of crime (murder, lynchings) and infectious disease (Abbot et al 2013).

Emphasizing the material wealth that could be extracted from the Rocky Mountains, this resulted in the sale of 'mineral lands' at lower prices to miners, giving early settler mine and farm owners the ability to profit off of wage labor (Hogan 1991). Claim clubs, pseudo-governmental entities to protect settler land rights, erupted around mining settlements and agriculturally

workable land, and later formed the political structure of territorial governance (Abbot et al. 2013, Murtazashvili 2013).

Attempts to establish modern society were also punctuated by cycles of boom and bust. By the early 1860's, the region was already experiencing economic decline due to the Civil War, difficulties presented by processing mined materials, unreliable profits, crop failure, and mounting hostilities between the settlers and the displaced Native populations (Abbott et al. 2013, Gomez 2007). To develop a democratic governance mirroring that of the incorporated

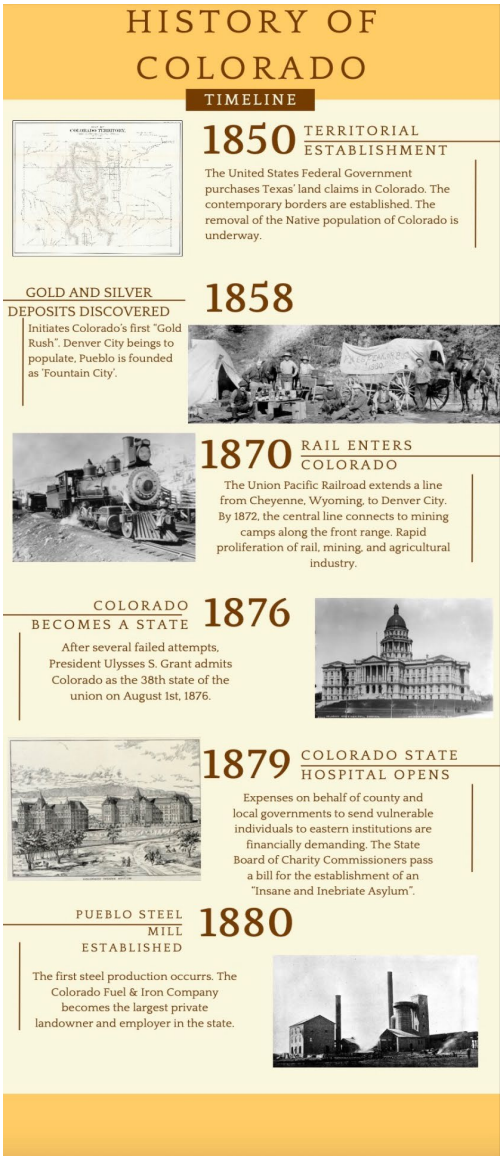


Figure 3.2: A short timeline of Colorado History.

United States, the Colorado territory was divided into districts where associated governments aligned with particular civic & mining interests. The idea of federal authority did not appeal to districts in which property rights were contested. Whereas miners defended the rights of laboring persons granting them the right to the product of their labor, farmers defended the right to cultivated land and the natural resources required to do so, and lot-owners defended property rights of merchants and businessmen (Hogan 1990). Opposition between political parties, disputes over the intrusion of national interests in local trade and economy, the struggle for railroad rights, and the contradicting interests between laboring and non laboring classes resulted in the reproduction of the frontier economy into the political structure of the State (Abbott et al. 2013, Hogan 1990).

The progress of the territory depended on population growth, economic activity, and the introduction of connections to the transcontinental railroad. Opening in 1870 for official use, the Denver Pacific railroad provided travel from the Union Pacific station from Cheyenne, Wyoming to Denver city. Shortly after, tracks were built outward toward mining settlements, opening the economy to tourism and resulting in savings on freight bills associated with mining and processing (Abbott 2013). The commercialization of Colorado's labor force and introduction of industrial technologies had extreme impacts on the conditions faced by laboring miners, smelters, and agriculturalists. Political strife caused by competition to secure water rights, local resistance to federal authority, labor strikes in response to industrial control, and disputes over rail building produced marked effects in the initial class structure of Colorado (Mitchell 2002, Hogan 1990). The first major labor conflict erupted in 1880 in Leadville as striking miners struggled with low wages, overwork, and poor management (Abbot et al 2013).

By 1876, Colorado met the census requirements for statehood, and was admitted into the union on August 1st. Many individuals who migrated to Colorado were first or second generation

immigrants from surrounding territories or foreign lands, as a result of famine, poverty, political repression, rapid population growth, and climatic change (Magennis & Lacy 2014, Wei 2021). Around this time, the 'Know Nothing' movement emerged, which aimed to politically organize 'native' born protestant individuals in order to subvert the ability for Catholic ideology to infringe upon civil and religious liberties. This was a direct response to the influx of immigration by German and Irish peoples, and the associated rise in crime and poverty rates. The movement was further bolstered by the anti-Catholic movement already present in colonial America. Established in the preconceived notion that 'native' born settlers were already assimilated to American culture, it was assumed that non-native born individuals would not be able to assimilate (Wei 2021).

Often, migrants of similar geographic and ethnic identities would convene in smaller sub-communities around mining camps and agricultural towns (Hogan 1991, Wei 2021). Influenced by the larger cultural and religious differences at play nationwide, this reinforced the structure of social division based on attitudes surrounding ethnicity and religious discrimination. Previously the border between United States territory and Mexico, the land to the south of the Arkansas River consisted of further displaced native peoples as well as settlements of Mexican individuals. Many employers exploited the labor of poorer Mexican American immigrants (Hogan 1990, Magennis & Lacy 2014, Wei 2021). Mining towns and early industrial centers like Pueblo would record the highest concentrations of individuals with 'foreign-born' ethnic identities (Abbott et al 2013).

3.3 Pueblo, Colorado

The initial settlement of "El Pueblo" was located along the Santa Fe trail, situated 29 miles from the Wet Mountains on the high plains. The area consists of a semi-arid climate and is positioned at the confluence of the Arkansas river and Fountain Creek. A major tributary of the

Mississippi River, the water flows eastward from its source near Leadville in the Rocky Mountains to its mouth in Arkansas. Early settlers, traders, and indigenous peoples used this route to travel Westward (Abbott et al. 2013).

By the year 1869, approximately 20,000 acres of dry land were already being cultivated with help from ditches diverted from the Arkansas river, irrigating crops and providing water for pastured livestock. Agricultural production supplied Pueblo County and supported the needs of nearby mining camps. Coal fields were also discovered in South Pueblo which positioned several companies to provide smelting services for the rail, coal, and iron industries after the Denver to Rio Grande railroad was expanded to Pueblo in 1872 (Painter 2002). Later, the town appealed to migrants interested in industrial labor opportunities in the smelting and processing industries.

Figure 3.3: A photograph of the first blast furnace at the Colorado Steel Mill.

Pueblo was formally incorporated as a city in the year 1873 after reaching a population of 3000 citizens (Mitchell 2022). Opening in 1880, the Colorado Fuel and Iron company (Figure 3.3) became the single largest employer in the city and the state, supplying itself with means and

materials to process minerals extracted from Leadville mines. By 1889, the Pueblo Union Stockyards were opened to serve the Denver & Rio Grande Western Railroad and the Atchison, Topeka and Santa Fe Railway allowing for the exportation of livestock and agricultural products.

The initial success appealed to the newly arrived immigrant population as well as domestic migrants, eventually making it one of Colorado's most ethnically diverse cities consisting of Irish, Italian, German, Slovenian, Serbian, Croatian, Greek, and Mexican communities according to the US Census (1880). By the 1870's the first post office, jail, public schools, private academies, newspapers, churches, public waterworks, and a bank had arrived (Mitchell 2002).

A number of inadequacies on the city and state level to accommodate persons with particularly vulnerable circumstances (such as the aged, sick, and impoverished) revealed law enforcement and social welfare issues as a result of a lack of infrastructure. Reports early in the year of 1879 called for the introduction of a State Inebriate and Insane Asylum in response to a purported increase in the number of individuals suffering from poverty, illness, or substance abuse (Pueblo Colorado Weekly Chieftain 1879). If they were not already being contained in jails or almshouses, the State took responsibility for their care and sent them to Oak Lawn Retreat, which would later become the Illinois State Asylum. County governments around the state engaged in disputes surrounding the bid for its establishment (Mitchell 2000). The issue was finalized with the provision that the institution should be located at Pueblo, as it was centrally located in the state with adequate access to water and rail (Pueblo Colorado Weekly Chieftain, 1879).

3.4 Caring for America's Mentally Ill & Defining Insanity in Colorado

Prior to the shift from independent to commercial labor, families may have been able to care for their aged, sick or disabled, and this transition initiated the implicit need for public structures to mitigate social and economic problems prompted by an inability to care for mentally ill or otherwise incapacitated individuals (Grob 1994; pg 6). Parallel to the 'Poor Laws' of 1601 enacted in England, early settler colonists issued taxes that made vulnerable individuals the

responsibility of the community. The development of almshouses aimed to provide sanctuary and welfare.

The typical ‘inmates’ of almshouses consisted of orphaned children, widows, the chronically ill, the disabled, the ‘insane’ and aged unhoused individuals (Sutton 1991). As communities grew, the rise of merchant capitalism and wage labor caused families or single individuals to have to provision care more frequently (Grob 1994; pg 7, 23). National reform agencies began to argue that poor-houses did not protect vulnerable individuals, nor provide humane care to the ill or disabled. The need for custodial institutions like the asylum developed in response to the social and economic necessities posed by ‘the almshouse problem’ and initiated a shift in the medical and therapeutic perception that impacted diagnoses of ‘insanity’ and their associated plans of care, proposed cures, and therapeutic treatments (Grob 1994; pg 63). As almshouses were shut down, individuals were transferred into state asylums.

The categorization of individuals as 'insane' occurred as a result of the social and economic initiative to separate the ‘distracted’ ‘indigent’ “lunaticks’ ‘insane’ ‘mentally deranged’ persons from the poor, as well as those experiencing ‘insanity’ or ‘madness’ from those who were deemed to engage in criminal acts on account of their own free will. “Although psychiatrists, beginning in the nineteenth century, had successfully “Medicalized” the official definition of insanity, the attribution of insanity in individual cases was still powerfully influenced by culturally-borne moral conceptions and practical lay concerns” (Sutton 1991; pg 667). “Insanity”, then, was not clearly defined, taken literally it meant anything other than what is perceived to be normal. A mechanism of identifying deviance, insanity was “an elastic status that could be applied to persons whose major problem was poverty, homelessness, or physical difficulty” (Sutton 1991; pg 667).

Admission into an asylum was often achieved through trial-by-jury, however the families of individuals who were for whatever reason unable to continue administering care could facilitate the institutionalization of an individual without the need for legal proof of insanity (Grob 1994; pg 46-47, Sutton 1991). Diagnoses in the form and causes of insanity were shaped by 19th-century conceptions of morality, in that an unbalanced mind was evidenced by 'mania' or 'melancholy' as mental illness. The classificatory schema used by many Superintendent physicians included describing behavioral symptoms due to a lack of moral judgment. This resulted in a lack of discriminating between cases or the adoption of clear treatments oriented toward curing disease. Instead, "moral therapies" were administered through the strict regimentation of a daily work routine (Grob 1994; pg 65, Thombs 1886).

The initial approach to mental illness in the United States was grounded in ideas of a moral universe, and the doctrine of free will and influenced by Protestant ideology (Grob 1994; pg 60). The character of the asylum model was one of custodial service *to* the vulnerable individual as well as *from* the community. Aside from physical illnesses, deviations from socially acceptable behavior were perceived as obstructive or dangerous in relation to individual morality. Armed with the faith that institutions could positively shape and alter human behavior, psychiatric concepts that emphasized the physical and moral environment were strengthened through the widespread adoption of environmental determinism. Health was approached as a consequence of a symbiotic relationship between nature, society, and the individual's control over their morality, which was mitigated by one's economic and social position within a given society (Grob 1994; p. 60). Improper conditions, immorality, physical ailments, and unnatural stresses were thought to be the cause of insanity. The 'treatment' could consist of counseling and care provided by a physician as well as a structured regiment and the provision of food, clothing, and shelter (Grob 1994; p. 69).

The ‘Association of Medical Superintendents of American Institutions for the Insane’ [AMSAII] became the first professional medical specialty organization in the United States in the year 1847 (Grob 1994; pg 71). The model that would be subsumed by institutions all over the country was introduced by the AMSAII and amplified by Thomas Kirkbride, the superintendent of the Pennsylvania Hospital in 1851 and 1853 (Figure 3.5). Aesthetically pleasing landscapes close to populated urban areas in close proximity to trains and roadways were chosen due to adequate access to water and drainage. The physical structure of the building separated patients by gender, as well as by the classification and severity of their illnesses. The Superintendent himself as medical actor and moral physician was meant to live within the asylum with his family and represent the pinnacle of wellness (Grob 1994; pg 72-73). As patients improved, they were moved to spaces closer to the center of their building in proximity to the Superintendent.

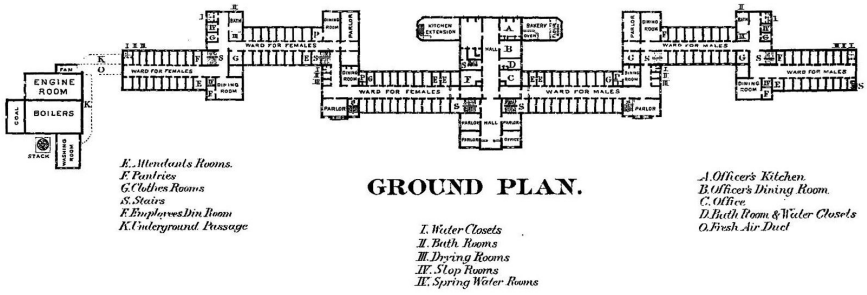


Figure 4.4: Blueprint of the original kirkbride plan. (1887), courtesy of arkansaslunaticasylum.wordpress.com

The role of the state to codify the symbolic concept of deviance through insanity was translated into official policy, and mitigated through specific institutional prerogatives to administer social control and welfare (Foucault 1979, Sutton 1991). According to Sutton (1991), the ideology of protestant morality that social problems were fundamentally individual and moral influenced the positions of ‘charity experts' and managers of institutions in the political arena. States became legitimized through their ability to model policies within the realm of the broader

normative discourse on the national level. Even though approaches to care shifted into the arena of medical discourse, the relationship between human behavior and morality was still understood as a disturbance in emotional states brought on by physical ailments. The general fiscal and political capacities of states to expand and invest in institutional systems (like asylums) were found to have marked effects on the allocation of funding and the carrying capacity of those facilities. The number of years since statehood reflected faster expansion rates for asylums in newer states, and richer states had greater capacity to accommodate growing demand (Sutton 1991). Sutton's findings reflected the incapacity of the federal government to offer solutions to the growing level of poverty and structural inadequacies of rapid state formation.

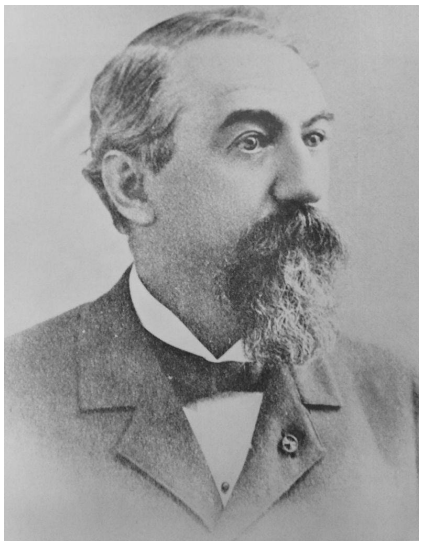
3.5 Colorado State Hospital

In Colorado, the bill for a "Colorado inebriate and insane asylum" was introduced in order to manage the costs of sending individuals to eastern institutions for care. Anticipating the need to involve medically trained individuals to oversee the organization and regulation of an asylum, the State government proposed to elect a Superintendent physician and three attendant physicians that would serve as a Board of Lunacy Commissioners. On February 1, 1879, the bill was ratified into law outlining the establishment of the state's inebriate and insane asylum (Whitmore 2020). The superintendent and Board of Lunacy commissioners were tasked with the prescription and publication of rules for organizational management with the power to employ all

Figure 3.4: A photograph of Dr. Pembroke R Thombs, courtesy of https://scalar.usc.edu/works/colorado-state-hospital/superintendents-and-staff-1

future subordinate physicians and attendants. Financial support for the asylum came in the way of a state mandated property tax along with a provisional donation by Governor Chilcott of 40 acres of land, $8000, and a farmhouse (Colorado Weekly Chieftain 1879). Dr Pembroke R Thombs (Figure 3.6), an Assistant Surgeon during the Civil War, had settled in Pueblo as an independent

physician in 1866. By 1879, Dr Thombs was a well-respected townsman and was elected for the position of superintendent.



To inform his practices, Dr Thombs traveled to eastern institutions where he took a particular interest in the Kirkbride model and the practice of Dr H.F. Cornel, superintendent of the asylum at Jacksonville, Illinois. The approach to treating medical illness taken by Dr Thombs reflects an orientation toward biological and environmental causes of disease. Evidenced by admission records as well as Biennial Reports, he approached the classification of disease by either emotional or biological cause, first in terms of gender, then by hereditary or environmental acquisition (James 2023b).

Early approaches to the medical treatment of insanity at the Colorado State Hospital were oriented toward meeting one's basic needs in a therapeutic or 'hygienic' environment. Thombs reported that no specific remedies were in use, however experimented from time to time with medicinal treatments, administering urethan (a hypnotic that is currently known to be a carcinogen) to individuals with cases of 'acute mania' (Thombs 1888). "Moral treatment" was only effective insofar as they could accommodate specific activities, such as card games, reading, or correspondence. Finally, "hygienic treatment" "consists chiefly in the adoption of correct rules in

living–regularity in rising and retiring, the taking of meals, bathing, cleanliness of rooms, and a proper supply of light, heat, and air… [and] plenty of employment for those physically able to help earn their daily bread by the sweat of the brow" (1888).

The first 11 patients were received on October 23rd, 1879 from the Oak Lawn Retreat, a private asylum in Illinois. Reaching full capacity by December 11th, the initial report indicated immediate need for a greater appropriation of funds to expand allotted land and erect more facilities to alleviate overcrowding, reflecting a natural increase in patient volume accompanied by rising proportion of the 'insane' in the state. Beginning with two initial buildings, the property was soon expanded, with officials citing crowded conditions to the extent that it was impacting the wellbeing of the patients. In all following reports from the 1879-1898 period, requests for further accommodations in order to properly support patients were made (Biennial Report of the Board of Lunacy Commision, 1880-1890). This quickly influenced the management of the asylum and resulted in engaging patients in the construction as well as operating a substantially productive dairy farm, (Figure 3.7) and cultivating major crops like corn, potatoes, melons, beans, squash, and an apple orchard (1888). Engagement in an occupation was interpreted by Dr Thombs as fundamental to the recovery of disease.

Figure 3.5: A photograph of the dairy farm, circa 1912, courtesy of the Colorado State Hospital Museum

The political and economic difficulties presented by increases in the number of insane amongst the state of Colorado were expected in Thomb's view. Marked difficulties in the acquisition of funds provided by the state, the growing demands of county-level admissions into the institution, and the level of incurable patients were reflected by his suggestions to find other accommodations, as the asylum model was meant to facilitate the cure of disease rather than providing long term care. Unable to facilitate the needs of counties, he began turning patients away due to overcrowding (Magennis & Lacy 2014, Newspaper). On the management of the asylum, he argued that although harsh measures were not permitted by physicians and attendants, the judicious use of mechanical restraint was employed in order to provide an economically efficient and humane approach to dealing with "violently maniacal or destructive cases". (Thombs, 1887-1888) In the year 1888 specifically, fifteen straight jackets were among the products made in the sewing room (Mitchell 2002).

Between 1888 and 1898, much of what is known about patient experience is solely evidenced by the Biennial Reports. It is worthy of note that at this time there were no physicians on staff and no centralized hospital for patient illness and injury (Thombs 1896). However, in 1898, visiting members from the board of charities to the asylum were accidentally locked in one of the wards. Their findings resulted in an investigation into the management of the asylum.

According to the investigation, the most startling discoveries were that of a deceased individual found unattended in their cell, and the attendant responsible for the ward had claimed that many patients went without medical care or supervision. The investigation revealed that the women's ward was equipped with one singular attendant, and at night, there was no supervision whatsoever for a period of six months until the investigation, and it was claimed that the physician would only visit the ward as much as three times per month. Insight into the financial position of the institution and the allocation of funds for specific needs was not systematically planned nor documented by Dr Thombs. Sadie Fischer, the supervisor of the women's ward, informed the board of charities that oftentimes patients admitted to the asylum would never meet the physician whatsoever. Patients who engaged in threatening behaviors could be left restrained up to three days at a time. If patients died under the attendants' supervision or were discovered deceased in their wards, ward attendants communicated the cause of death to Dr Thombs, who would often not examine the individual himself (Pueblo County Chieftain, 1898).

Upon completion of the investigation, the State Board of Charities and Correction recommended: (1) the replacement of the superintendent, (2) a thorough system of record, report, and bookkeeping be established, (3) patients must be given regular and frequent outdoor exercise necessitating the need for an increased number of attendants, (4) the state enact a new lunacy law defining the duties of the superintendent and commissioners, (5) that the superintendent devote themselves solely to the asylum, two resident physicians be hired to administer treatment, civil services principles ought to be adopted for all positions in the asylum, and (6) that the asylum location was desirable and that there was no need for an additional asylum in the state (Mitchell 2002). According to the State Board of Lunacy Commissioners, the shortage of funds provided by

the existing legislature as cause for these inadequacies was admitted, however they claimed that the allotted funds ought to have been sufficient under proper management (Mitchell 2002).

The historical and archival documents, when considered in their social context, reveal the relationship between the rapid shift between frontier territory to statehood and the efficiency of this institution (Geloso & March 2021). The conditions of patients reported by witnesses, evidence from financial documents, and patterns of minority and marginalization in the admission records demonstrate a level of structural inequality and violence with respect to the individuals who experienced institutionalization at the Colorado State Hospital.

3.6 Social Epidemiology

Although no records are presently available to identify the individuals associated with 'Cemetery 2', an epidemiological analysis of the admissions records kept by the Superintendent provides some context for understanding the risks of institutionalization. Magennis and Lacy (2014) offer a qualitative analysis of factors related to admission based on data such as gender, marital status, diagnosis, social class, as well as immigrant status. Between 1879-1898 the Superintendent kept records of the patient's county of residence, civil condition, nativity, occupation, presenting cause and form of insanity, relevant history, discharge date, death date, and cause of death. According to biennial reports and attendant witnesses, when families were unable or unwilling to retrieve their dead from the institution, the funerary responsibility fell on the Superintendent.

The report showed that approximately 1,935 individuals were admitted within the years 1879-1900. Approximately 42% (n=505) of admitted individuals died while institutionalized, with a differential risk of mortality resulting in higher risk for male individuals. Their findings also

suggest a pattern of marginalization and minority regarding an individual's ethnic identity, socioeconomic status, and occupation. Evidenced by a higher admission rate of individuals in 'typically lower skill' occupations, potentially due to a lack of economic resources to sustain their own care. This may also reflect individuals with conditions that result in impaired social function leading to occupations with lower prestige. Foreign born men and women were institutionalized at 2 & 3 times the rate of native born individuals, specifically those of Irish or Mexican descent.

3.7 CONCLUSION

Although the biennial reports and admission records can be assessed to consider aspects of personhood and identity that potentially led to institutionalization, they do not lend themselves toward uncovering the histories, experiences, and narratives of individuals and their lived experiences. These documents offer a cross-sectional snapshot of a particular event (institutionalization) that only accounted for a small portion of many of these individual's lives. By contextualizing this social and historical data with evidence derived from the bodies of these individuals, unwritten histories recorded in their bones can reveal *human* stories, intact and unmarred by the manipulation of written historical records.

Chapter 4: SITE BACKGROUND AND GENERAL METHODS

4.1 Introduction

In this section, I begin with the archaeological site report from the excavation in 2000 and the existing archival and documentary sources relevant to the socio-historical background of the institution. I then detail the bioarchaeological methods used for obtaining the skeletal data such as age and skeletal sex estimation, and paleopathological descriptions of traumatic injury to bone. This study utilizes methods derived from the Buikstra and Ubelaker Standards for the Data Collection of Human Remains (1994).

4.2 Site Background, Mortuary Context and Sample Composition

Today, the Colorado Mental Health Institute is situated in the western portion of Pueblo, located one-half mile from the Arkansas River (Painter 2002). Initially, Cemetery 2 was discovered by a group of employees attempting to repair a water line when they realized they had inadvertently disturbed the graves of 3 or 4 individuals in the 1970's. When finally excavated in 1992 out of a necessity to expand the facility, the Colorado Department Of Corrections worked in collaboration with the Colorado State Archaeologist of the Colorado Historical Society, and employed volunteers and then-current inmates of the State Hospital to excavate the remains of approximately 131 individuals.

In 1998, additional remains were uncovered as plans to continue developing the property threatened the integrity of further potential burials. At this point, the Department of Corrections contracted Centennial Archaeology Inc. and Colorado State University to survey the cemetery area and excavate any additional remains (Painter et al, 2002). The excavation resulted in the recovery

of at least 31 more individuals resulting in a total of approximately 155 individuals. The three or four individuals initially found in the 1970's were consequently discovered in a secondary burial context, associated with burial 00-1 (Painter 2002). In the summary of investigations, the author notes that the individuals were buried contrary to official procedure as the cemetery was oriented in the northwestern portion of the property with no evidence of grave markers, and no documentary evidence of their identities. Archives indicate that the cemetery consists of individuals whose families would not or could not make arrangements to retrieve their bodies. In the financial reports to the Board of Lunacy Commissioners, there are funeral expenses accounted for in the yearly audits. According to the DOC report, the graves were arranged in neat rows in east-west orientation, consisting of interment into rectangular or hexagonal wood coffins composed of pine, juniper, and spruce (Puseman 2002).

The individuals included in this study are part of a larger project entitled *Analysis of Skeletal Trauma and Dental Health of the Colorado State Asylum Collection* directed by Dr. Lauren Hosek, Principal Investigator. In this thesis, the subsample of 40 individuals from the collection were analyzed for age, sex, and skeletal lesions using methods detailed in the following.

4.3 Methods: Age and Sex Estimation

Introduction

Bioarchaeological methods for age and sex estimation are derived from skeletal collections which are originally accompanied by records of an individual's associated biological attributes. The morphological characteristics used to inform these estimations are grounded in fundamental ideas in the human biology of growth and development. Because methods used in age and sex

estimation are best done in a total-analysis approach, it is recommended that all available methods are considered before making a final determination (Buikstra & Ubelaker 1994).

Age Estimation

Age-related morphological changes to the skeleton in the pubic symphysis, cranium, auricular surface of the ilium and the sternal rib ends are considered to be the most reliable for estimating skeletal age-at-death. Meindl & Lovejoy (1985) developed age estimations using the cranial sutures, which generally tend to fuse with increasing age. The degree of sutural closure is recorded on a scale from 0, or open (no evidence of any ectocranial closure) to 3, complete obliteration (complete fusion). Taking composite scores from the vault and lateral-anterior sites of the cranium, age ranges are determined by degree of overall closure. Because of the wide range of variation in sutural closure rates, this method is considered to be the least reliable, and ultimately used to supplement the others. In opposition to suture closure, the morphology of the pubic symphyseal face is considered to be most reliable because of their unique age-related changes that continue after an individual reaches maturity. Younger individuals' pubic symphyses have a rugged, billowing appearance. As a person ages, the surface loses relief and is bounded by a rim around age 35 (White 2012). After this age, progressive deterioration and erosion result in a pitted or porous appearance and an irregular shape. The Suchey-Brooks (1990) scoring system was employed in this study.

The auricular surface of the ilium also exhibits systematic morphological age-related changes. The features used to record age changes are the apex, superior demiface, inferior demiface, and the retroauricular area. Characteristics such as billowing, granularity, density, and porosity are used to describe morphological changes to specific features. Lovejoy et al (1985)

divided these changes into 8 phases in order to associate specific changes by area to chronological age. The final age estimation technique used in this study is age-related morphological changes to the sternal end of the fourth rib (Stevens 1979). Pit depth, shape, rim, and wall configuration are associated with 6 stages of degeneration.

After estimations were made using each method, a composite range was determined and associated with a specific age category. Age category distinctions were taken from Buikstra & Ubelaker (1994) and individuals were classified as young Adult (20-35), middle Adult (35-50), and old Adult (50+).

Skeletal Sex Estimation

Standard methods for skeletal sex estimations are based on human sexual dimorphism and are most accurate after the individual has reached maturity (White and Folkens 1992). Generally, skeletal elements associated with females are smaller in size and exhibit more gracile features in comparison to the large and rugose features associated with males. The skull and pelvis exhibit the largest differences between the sexes, however there is a continuum of variation that exists within our species amongst the sexes. Categories used to describe sex estimations range from: female, probable female, indeterminate, probable male, or male. A determination of "unknown" is used to characterize individuals whose available skeletal elements are not sufficient for estimation due to taphonomic alteration, missing elements, or ambiguous features.

Following the tendency for male sexed individuals to exhibit larger and more robust skeletons, the characteristics used to make sex estimation are the prominence of sexually dimorphic landmarks. For the skull, these landmarks are; supraorbital ridges "brows", supraorbital margins, mental eminence (chin), mastoid processes, and the nuchal crest. The prominence of these

characteristics are scored from 1 to 5, 1 representing ‘hyperfeminine’ and 5 representing ‘hypermasculine’. For postcranial characteristics, Stewart (1979) identified male and female ranges for the vertical diameters of the humeral and femoral heads.

The methods used to estimate sex using the pelvis are based on the tendency for female bodies to exhibit gracile characteristics, but are also characterized to represent the functional capacity for locomotion and childbirth (White & Folkens 2012; pg 237). The morphological features of the pelvis such as the ventral arc, subpubic concavity, subpubic angle, ischio-pubic ramus ridge, greater sciatic notch width, preauricular sulcus, auricular surface elevation, and overall curvature of the sacrum are used in sex estimation. “Female” pelves have relatively larger subpubic angles, wider inlets and greater sciatic notches, and longer pubis proportions (ie the ischiopubic ramus). Finally, specific characteristics like the preauricular surface and an elevated auricular surface are considered to be ‘female’ features due to their presence and role in widening the pelvic inlet.

4.4 Methods: Analysis of Traumatic Lesions

Adopting techniques from forensic anthropology and clinical medicine, recent bioarchaeological studies of skeletal trauma are used to describe traumatic injury (Galloway & Wedel 2014; Morgan et al 2022; Lovell 1997). Trauma refers to an injury that is sustained by an external force or mechanism applied to living tissues (Lovell 1997). The interpretation of trauma and the type of force in paleopathology relies on the visual assessment of the characteristics of a given wound in relation to the anatomy of the afflicted skeletal element. Ortner (2003) defines the types of skeletal trauma to include a partial or incomplete break to a bone, the abnormal displacement or dislocation of a joint, a disruption in the blood or nerve supply, or an artificially

induced abnormal shape or contour of a bone. These types are further differentiated by distinct features of the break, which indicate the cause as the result of direct or indirect mechanisms, mechanical stress, or pathologically as a result of an underlying disease state.

Analysis and interpretation originates with the description and diagnosis of skeletal trauma which includes: the proper identification of the affected element, its location, the appearance of the lesion and associated measurements with respect to size, classifying the type of trauma, interpretation of the biomechanics of the injury, associated evidence of a preexisting condition, time elapsed since injury by healing stage, and evidence of other traumatic injuries to the skeleton (Grauer & Lovell 2018).

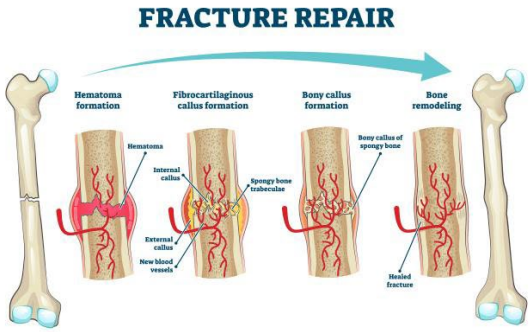


Figure 4.1: Stages of fracture repair, courtesy of https://abs.orthofix.it/blog/bone-healing-and-the-role-of-external-fixation/

Fracture healing (Figure 4.1) begins immediately after injury and follows a general timeline which may be affected by a wide variety of factors such as the type of bone affected, fracture location, severity, and the stability of the fractured ends. These are also influenced by specific characteristics of the individual such as age, hormone status, and health status (Galloway et al.2014, Lovell 2008, Morgan et al 2022). In the living body, the first stage of healing begins immediately as blood flows into the injured area from disrupted vessels resulting in a hematoma within the first 24 hours of injury. This provides an initial scaffold for the fibrocartilaginous callus

formation process with the local stimulation of cytokines and bone morphogenic proteins occurring within the first 48 hours and can continue for three to four weeks (Morgan 2022, Lovell 2008). The second stage begins at two to three weeks and involves the formation of a soft cartilaginous callus within the hematoma stabilizing the fracture that eventually begins mineralizing. Then, within two to three weeks, the bony callus formation results in the mineralization of the cartilaginous structure beginning with the edges of the fracture within 6-8 weeks consolidating the woven, or disorganized bone and the formation of mature lamellar bone begins to form the hard callus. In the fourth and final stage, osteoclasts (bone removing cells) and osteoblasts (bone forming cells) remodel the woven bone into mature lamellar bone, which can occur for several years after the initial injury. These characteristics are used to determine whether an injury exhibits macroscopic evidence of healing, and the approximate amount of time elapsed since injury.

Determination of the cause of traumatic injury is highly dependent on fracture location, timing, and type. The diagnostic criteria for the determination of timing of traumatic injury is reliant upon visible evidence of healing observed and the condition of the bone at the time of fracture (Galloway et al., 2014). Traumatic injury timing is differentiated in three categories, antemortem (prior to death), perimortem (along with or around the time of death), and postmortem breakage (after death). Antemortem fractures are chiefly recognized through evidence of healing which is macroscopically visible in the form of woven bone, lamellar bone, and callus formation near the injury site (Galloway et al., 2014; Morgan et al., 2022). Perimortem and postmortem fractures are more difficult to differentiate due to the lack of surrounding soft tissue to evidence injury and lack of healing response. (Galloway et al., 2014, Kemp 2016). Because of this, criteria used to differentiate perimortem from postmortem trauma include the fracture patterns themselves.

Differences in the fracture surface morphology in regard to the texture of ‘fresh’ bone (resulting in a smooth appearance) to ‘dry’ bone (resulting in a rough appearance), and the proper consideration of taphonomic processes such as staining, weathering, and moisture exposure (Galloway et al., 2014, Kemp 2016).

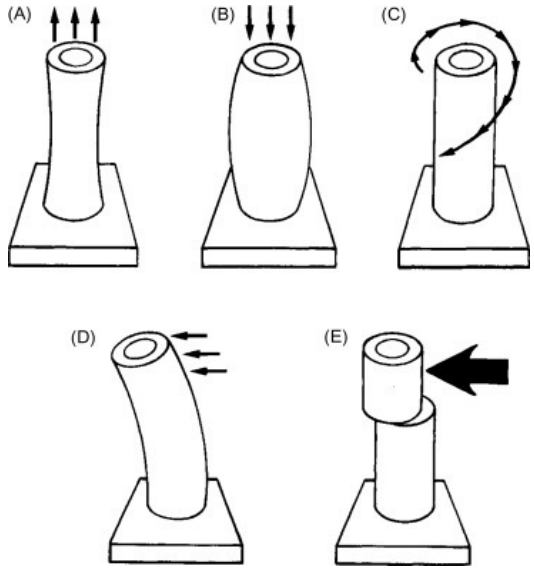


Figure 4.2: Taken from Ortner (2003) pg 213, the five directions of force.

The determination of fracture causation is characterized by the type, direction, speed, and focus of the source of traumatic injury. Ortner (2003) distinguishes five directions of force (Figure 4.2): a) tension (pulling, usually along the long axis), b) compression (pushing down), c) torsion (twisting), d) bending, and e) shearing (similar to bending, but involves the immobilization of one segment of bone). The speed of force refers to the rate of biomechanical loading. Longitudinally, bones are relatively elastic but fragile in the transverse direction. Static loading forces are associated with loading stress applied constantly, and dynamic loading forces are associated with sudden stress applied suddenly and at high speeds (Beyers 1992, Galloway et al., 2014). Finally, focus refers to the size of area impacted and is differentiated between wide (over a large area) and narrow (a single point) (Beyers 1992, Galloway et al., 2014).

Fractures are either incomplete, or complete and direct or indirect. Incomplete fractures are those which retain some degree of continuity among the affected bone (Galloway et al., 2014; pg 59). Complete fractures (Figure 4.3) are those that result in a discontinuity between one or more fragments. Fractures of this category usually take seven forms.

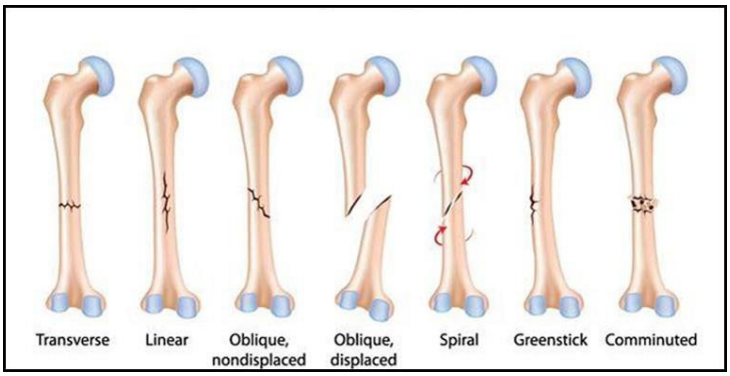


Figure 4.3: The seven most common fracture types. Taken from https://www.orthopedic-institute.org/fracture-care/types-of-fractures/

Transverse fractures are typically clean breaks perpendicular to the long axis of the bone. Linear fractures occur along the long axis, and oblique fractures occur diagonal to the bone's long axis. Fractures can also be displaced, where the broken ends of the bone are separated to the degree that one fragment is left at an angle after the healing process. Comminuted fractures involve injuries in which more than one fragment is generated (Galloway et al. 2014; pg 65, White 2012; pg 434). There are also many other types of fractures with specific etiologies that relate to the mechanism of injury (Figure 4.4).

Other Fracture Types	
pathological	when bone is weakened or made brittle by disease (osteoporotic, infection, cancer, noncancerous tumor)
fatigue	when bone is exposed to [intermittent] stress over a long period.
stress	cracks in the bone caused by repeated strain and overuse
avulsion	small piece of bone detaches where ligaments and tendons attach
simple (single)	a single discontinuity along one line produces two bone segments
segmental	a long bone broken in two or more places
comminuted (multi-fragmentary)	the break produces several (three or more) pieces of bone or fragments
spiral	a torsion fracture caused by twisting
depressed	pushed in with fragments of bone depressed below the adjacent surface
diastatic	a widening or separation of the cranial bones at the sutures
basilar	a bone break at the base of the skull
hinge	a peeling or flap of bone, still attached at one side, caused by a sharp force across the cortical surface of bone
impacted/compacted	broken fragments are embedded into each other
cleft	a V-shaped notch caused by a near vertical force applied by a heavy instrument with a sharp edge

Figure 4.4: Miscellaneous fracture types. Table taken from White (2012), pg 434.

Finally, trauma is divided into three types: blunt force, sharp force, and projectile. Blunt force trauma is caused by a dynamic force over a wide focus with relatively low velocity. These injuries mainly occur from compression, bending, and shearing forces (Redfern & Roberts, 2008). Sharp force trauma is the result of compression or shearing forces over a narrow focus and are usually caused by an object with a point or edge (Beyers 1992). Projectile traumas have characteristics of both blunt and sharp force trauma but are distinguished by their distinctive wounding characteristics caused by high-velocity objects such as bullets, arrows, or spears. The focus usually begins narrow but becomes wider as the projectile exits the affected bone through compressive or bending forces (Beyers 1992).

4.5 Conclusion

These age and sex estimations were applied for each of the forty individuals included in this sample. Analyses of traumatic lesions were completed when necessary in order to assess the prevalence of trauma amongst the sample and compare it amongst different age and sex cohorts.

Chapter 5: RESULTS

5.1 Introduction

The results of the quantitative analyses of skeletal trauma are presented below. Trauma was described, photographed, and illustrated on body schematics. Each lesion was documented by location, type, state (antemortem or perimortem), and degree of healing. Further assessment of the potential biomechanical cause of certain fractures was made using relevant literature. First, the results are provided through the overall demographic assessment of the sample by age and sex. Traumatic injuries were divided into seven body areas: the skull, shoulder, upper limbs, ribs, vertebrae, pelvis, and lower limbs. For each body area, I include the prevalence of injuries within the sample and provide descriptions of specific injury characteristics.

5.2 Age & Sex Demographics

In Magennis and Lacy's (2014) demographic comparison between the asylum and the general population of Colorado, men were found to be 1.5 times more likely to be institutionalized than women. A paleodemographic study on the mortality and morbidity of the complete CSH skeletal collection conducted by James (2023) revealed that males were over three times as common in the cemetery as females. This is potentially due to the likelihood of males to be institutionalized as well as remain at the asylum until death. The age and sex distribution of the sample of individuals from Cemetery 2 analyzed in this study is presented in Table 1. The male to female ratio in this subsample is 3.44 (n=31) to 1 (n=9).

Age	Male w/fx	%	Male no fx	%	Female w/fx	%	Female no fx	%
YA	2	8.70%	3	37.50%	1	25%	4	80%
MA	10	43.48%	4	50%	2	50%	0	0%
OA	11	47.82%	1	12.50%	1	25%	1	20%
Total	23	100%	8	100%	4	100%	5	100%

Table 5.1: Age and sex distributions of individuals within the CSH sample. ‘Fx’ means fracture.

Age distributions taken from the admissions records demonstrate that male individuals tended to live longer than females (Magennis and Lacy 2014, James 2023). They reported more female than male patient deaths for the Young Adult cohort (20-34 years), which is reflected in this sample. Young adult (20-35 years old) females in the epidemiological investigation into the collection were 3.4 times as likely to die while institutionalized than males (James 2023a). In the middle (35-50 years old) and older (50+) adult cohorts, male individuals exhibited a longer lifespan. The distribution of skeletal trauma by sex in the study sample reveals that male individuals with trauma tended to be older (middle or old adult age categories). The distribution of trauma by age for females is more ambiguous, likely due to the smaller sample size. Males were more likely to exhibit trauma than females, with nearly 75% of male skeletons exhibiting at least one fracture compared to 50% of the females in the sample.

5.3 Trauma Prevalence

Out of the 40 adult individuals included in this study, 67.5% (n=27) displayed evidence of at least one traumatic injury. The sample included a total of 31 estimated male individuals and 9 estimated female individuals. There were 15 individuals with traumatic injuries to more than one body area, nine of which (8 males and 1 female) showed evidence of injuries to different body areas at multiple stages of healing. To compare the prevalence of traumatic injuries to other similar 19th century institutional contexts, data from Lori Tremlay's 2017 doctoral dissertation on the impacts of structural violence was compared to the overall prevalence of trauma at CSH (Table 1). Their study engaged in a comparative analysis of the skeletal assemblage associated with the Milwaukee County Institution in Wisconsin (1882-1925), and the Oneida State Custodial Asylum of upstate NewYork (1860–1890).

Site	Individuals with trauma	without trauma	Total	%
Oneida*	6	40	46	13%
MCIG*	31	84	115	27%
CSH	27	13	40	68%

Table 5.2: *Values taken from Tremblay (2017). Oneida represents the Oneida State Custodial Asylum, and MCIG stands for the Milwaukee County Institution Grounds.

A chi-square test of independence was conducted to determine if there exists a relationship between institution location and prevalence of trauma. The result ($X=32.19$, $p<0.00001$) suggests that the higher prevalence of trauma at CSH is statistically significant.

5.4 Trauma by Body Area

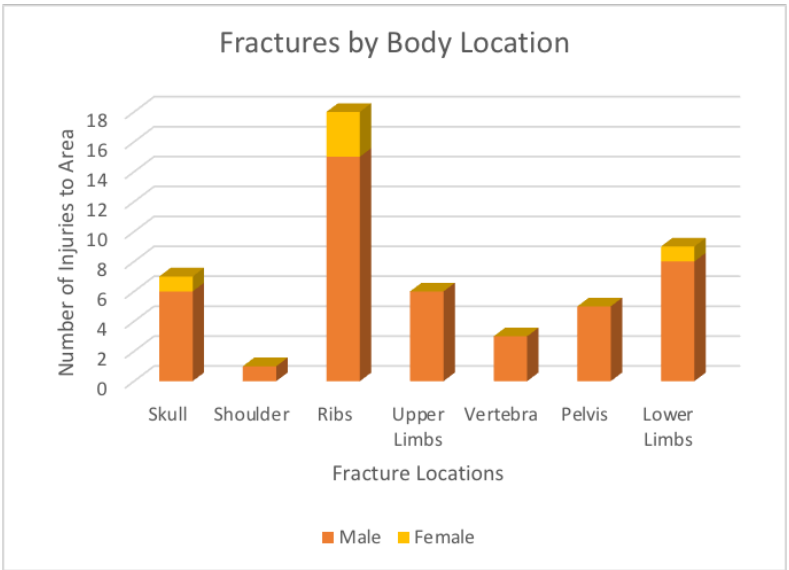


Figure 5.1: Fractures by body location.

Injuries were separated into 7 body areas: the skull, shoulder girdle, ribs, upper limbs, vertebra, pelvic girdle, and lower limbs (White 1992). Fractures by body location are presented in Table 3. Out of the 27 individuals exhibiting traumatic injuries, 56% (n=15) presented with injuries to more than one bodily area. The ribs were the most affected body area in the sample, accounting for 66% of those with fractures. In other words, 45% of the individuals in the study sample exhibited one or more fractures to the ribs.

Skull

The bones of the skull consist of the cranium and the mandible. The cranium is divided into the cranial vault (encompassing the frontal, parietals, the squamous portion of the temporal and and the occipital) the base of the cranium (including the basal part of the occipital, the temporals), and the bones of the face (including the nasals, maxillae, zygomas, and the delicate inner bones) (White 1992). The frequency of skull fractures is 26% (n=7) of individuals with fractures, and 17.5% of the total study sample. All injuries were classified as antemortem. Figure 5.2 & 5.3 present a composite schematic of fractures to the cranium and mandible.

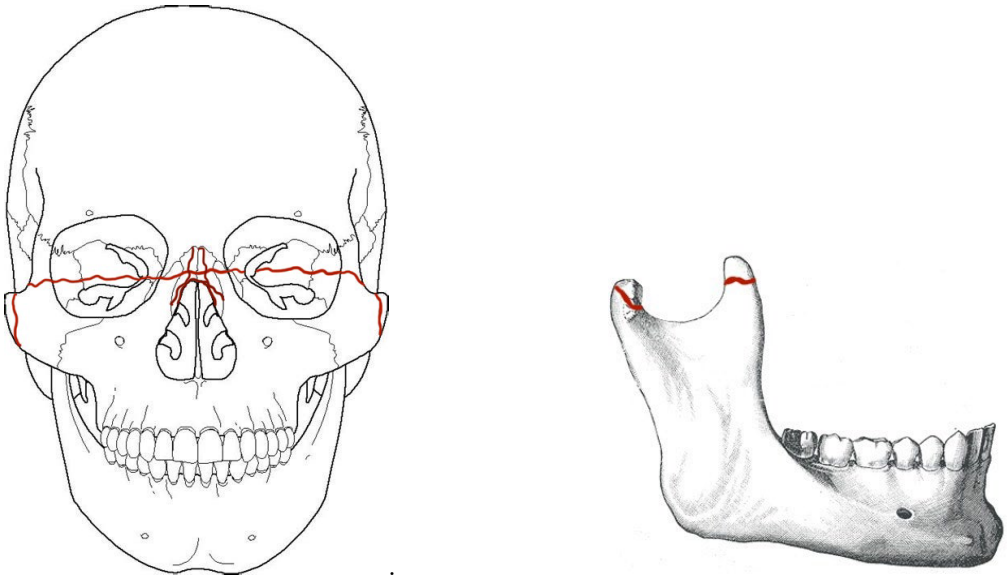


Figure 5.2 (left): a schematic of the cranial fractures. Figure 5.3 (right): a schematic of mandibular fractures. Healed injuries are depicted in dark red.

Males exhibited the highest number of fractures to the cranium, with a male to female ratio of 6:1. Interestingly, there was no evidence of trauma to the cranial vault among these injuries. The most frequently fractured elements were the nasals, with such fractures present in 4 individuals (one young adult male, and three older adult males). Two individuals exhibited fractures to the mandible, and one individual exhibited a fracture to the zygomatic arch. In clinical and paleopathological literature, trauma to the nasals is usually the result of a blunt force injury.

Common causes are falls from a standing height, or instances of assault, such as punches and kicks (Lovell 1997, Galloway et al., 2014; pg 150-151). Forces with a higher impact often result in a higher degree of comminution (breakage into multiple fractures). Bremke et al (2009) reported on a clinical study that revealed a higher incidence in males between the ages of 20-40 years, and a peak with advancing age in elderly individuals.

One individual presented with a Le Fort type III fracture to the maxilla, involving the nasals and zygomas. The injury extended into the orbits of the eyes and through the bridge of the nose. Maxillary fractures are reported to be one of the most common fracture complexes of the face (Galloway et al., 2014; pg 151). Reported causes in clinical and paleopathological literature consist of blunt force injuries as a result of a fall, or from blows to the face in instances of interpersonal violence. The extent of injuries is dependent upon the resistance to fracture by the maxilla, which is dependent upon the status of the dentition (Galloway et al., 2014, pg 151-152). “Dentition” refers to the condition of the teeth and their arrangement within the mouth. Their condition can have dramatic effects on the structural integrity of the maxilla and mandible as well as the overall health of an individual. These injuries tend to occur to male individuals more frequently.

Two individuals presented with fractures to the mandible, including a well healed fracture to the left condylar head observed in an older adult male. Fractures of the mandible typically occur to the body, ascending rami, and the condyles, with the fractures of the coronoid process and ascending ramus less frequently encountered (Galloway et al., 2014; p 154). Men are more likely to receive mandibular fractures from assaults followed by falls. Conversely, women are more likely to experience mandibular fractures as a result of falls, and from assaults less frequently (Kozakiewicz & Walczyk, 2023).

A middle-adult female exhibited a healing fracture to the right coronoid process of the mandible. These fractures are extremely rare, and typically co-occur with other fractures of the face (Ogura et al., 2017). The coronoid process is usually protected by the zygomatic arch, and fractures to the coronoid process are usually accompanied by related injuries to the zygomatic bone. It is possible that there was an accompanying injury to the right zygomatic bone, however the potentially affected portion was lost and/or damaged in the excavation process.

Shoulder and Upper Limbs

There were seven total fractures to the shoulder and upper limbs (Figure 5.4). These areas include the clavicle, scapula, humerus, radius, ulna, carpals, metacarpals, and hand phalanges. Six male individuals (two young adults, one middle adult, and three older adults) obtained fractures to the upper limbs and one older adult male (C-20) received two injuries to the shoulder. All injuries were classified as antemortem.

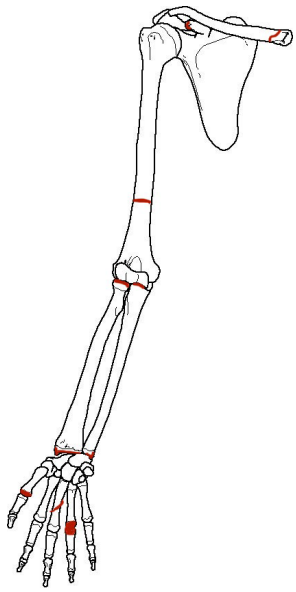


Figure 5.4: A composite sketch of the trauma to the upper limb and shoulder girdle. Healed injuries are depicted in dark red.

Individual ‘C-20’ exhibited a well-healed fracture to the sternal end of the right clavicle, as well as an avulsion fracture to the lateral end of the coracoid process on the right scapula. Injuries to the clavicle occur as a result of direct or indirect trauma, most frequently in the middle 1/3rd of the shaft, typically due to a fall from standing height onto the lateral aspect of the shoulder (Lovell 1997). The mechanical causes of these types of fractures vary from falls, occupational hazards, or direct violence (Galloway et al., 2014; pg 197, Lovell 1997). However, Habermeyer et al. (2006) found that fractures to the sternal end of the clavicle were the least frequent, and their associated mechanisms of injury are direct blows that drive the clavicle medially, with force applied from a lateral angle.

Fractures to the scapula are relatively uncommon, and occur most often to individuals between 40-60 years of age as a result of direct trauma as a result of a fall from height, or crushing injuries (Galloway et al., 2014; p 200). Fractures to the coracoid process often involve accompanying fractures of the shoulder girdle and often occur as the result of a direct blow to the shoulder area (Li et al. 2019). Given the degree of healing present on both injuries, it is reasonable to infer that both injuries experienced by C-20 were accrued in the same event.

The humerus is the largest bone in the upper limb, and articulates with the shoulder girdle as well as the radius and ulna. A young adult male individual exhibited a well-healed complete transverse fracture to the distal ⅓ of the humeral shaft, with the distal portion of the bone displaced anteriorly. Fractures to the humeral shaft are most often the result of accidental injury or directed violence, with higher impact forces resulting in transverse fractures (Galloway et al., 2014). In young individuals, fractures to the shaft occur as a result of higher impact forces, whereas older individuals are more likely to experience injuries from lower-impact forces (Bounds et al. 2024).

The bones of the forearm are the most commonly fractured elements of the upper limbs (Patel et al. 2021). Typically, fractures to the radius and ulna result from falls onto outstretched arms. One older adult male experienced an avulsion fracture to the superior and inferior margin of the semilunar notch involving the tips of the coronoid and olecranon processes. On impact, the failure of the joint results in dislocation and forward displacement of the ulna, fracturing the tip of the olecranon process. The sudden pull and hyperextension of the brachialis muscle results in avulsion of the olecranon process (Galloway et al., 2014; p 224-225, Masood et al. 2021).

Three individuals exhibited injuries to the radius. The mechanism of injury is dependent on the location of the fracture. One individual obtained a complete comminuted fracture of the distal joint surface. This is most consistent with a Chauffeur's fracture, in which a blow to the palmar side of the hand drives the scaphoid into the styloid process of the radius, caused by avulsion of the radiocarpal ligaments or radial collateral ligament (Galloway et al., 2014; p 223). Another individual received a comminuted fracture to the radial head. Injuries to the head of the radius are usually a result of a fall on an outstretched hand, crushing wrist injuries, and direct blows to the hand. In injuries from more severe forces, there is a higher degree of comminution (Galloway et al., 2014; p 218-219, Lovell 1997).

Three injuries to the hand were observed in male individuals, two to the metacarpals and one to a phalanx. Fractures of the metacarpals are frequently associated with interpersonal violence, and common among young adult men (Nakashian 2012). Fracture mechanisms are classified by their distribution, location, and proximity to impact (Galloway et al., 2014; p 236). A healed incomplete "Boxer's Fracture" was observed on the first metacarpal (the thumb). Fractures to this area are clinically associated with high impact forces to a clenched fist (Galloway et al.,

2014; p 239, Lovell 1997). Another had a well healed spiral fracture to the third metacarpal, most likely the result of indirect or rotational forces (Galloway et al., 2014; p 236).

One particularly complex fracture involved numerous elements of the upper limb. A severe, comminuted Colles fracture to the left forearm, consistent with a fall on outstretched arms, was observed in an older adult male. The injury resulted in the crushing and bony ankylosis (fusion) of each of the carpals to the second, third, and fourth metacarpals. The distal ulna had a complete fracture of the neck, accompanied by extensive remodeling and pseudoarthrosis between the carpals and the distal radius. The Colles fracture results in the distal disarticulation of the forearm, however with the palmar side down, it appears that the injury healed with the radius crossing over the ulna and the thumb medially positioned. This injury has the appearance of more of a crushing injury of the wrist, possibly from a higher impact than a mere fall from standing height (Galloway et al., 2014; pg 222-223).

Vertebrae

Fractures to the vertebrae are extremely common in elderly individuals and often occur without other associated injuries. Compression fractures to the vertebral body are most frequently observed in cases of spinal injury, and are associated with indirect trauma. Three male individuals exhibited healed compression fractures to lumbar vertebrae (Figure 5.5)

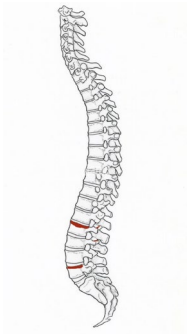


Figure 5.5: A schematic diagram depicting vertebral injuries in dark red.

Because of their size and biomechanical properties, lumbar vertebrae have greater flexion-extension ability than the thoracic or cervical vertebra. The majority of injuries occur as a result of compressive forces with a degree of flexion. A Smith fracture complex was observed in the third through fifth lumbar vertebra of an older adult male, consistent with the upper body being thrown forward while the legs and pelvis are stationary (Galloway et al., 2014; pg 181-182).

Ribs

The ribs form a protective cage around the internal organs of the thorax, and are designed to tolerate moderate in-bending forces (White 1992). Rib fractures result from blunt forces internal or external to the thoracic area, and are among the most frequently reported injuries in contemporary communities. Stress fractures are known to occur as a result of habitual strenuous labor (Lovell 1997). Biomechanical causes range from accidents, falls, direct blows to the chest, or severe coughing fits (Hanak et al. 2022, Morgan et al. 2022). The outcomes of rib injuries are variable and depend on the individual's health and age, the fracture location (head/neck, mid-shaft, sternal end), number of ribs fractured, and biomechanical cause (Morgan et al. 2020). Injuries to the chest wall can result in long-term pain, deformity, and increased morbidity and mortality (Brickley 2006, Morasco et al. 2015). According to a study on the outcomes of rib fractures in the National Trauma Databank, 50% of cases result in admission to an intensive care unit (Peek et al 2020).

In an analysis of injuries by body location in the study sample, the most common fracture site was the ribs with 18 individuals (66% of those with fractures) displaying one or more rib fractures for a total of 95 rib fractures across the sample (Figure 5.6). Males accounted for 83%

(n=15) of those with rib injuries. In modern clinical settings, 70% of rib fractures in the National Trauma Databank were experienced by men (Peek et al 2020).

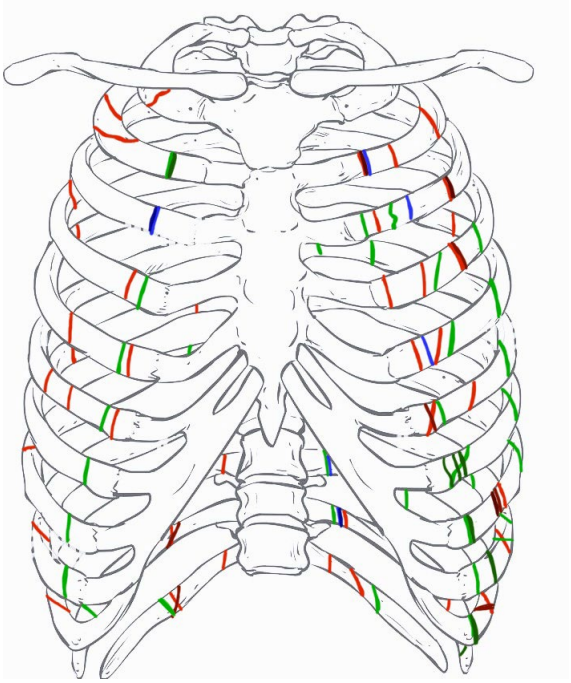


Figure 5.6: A composite schematic of the rib trauma in this sample illustrates the distribution of breaks, fracture type (transverse or oblique), and degree of healing. Well healed fractures are indicated in red, healing injuries are indicated in green, and injuries with no evidence of healing are indicated in blue.

In nine of these individuals, fractures at different stages of healing were identified, suggesting multiple traumatic incidents or trauma recidivism. The few perimortem rib fractures were all transverse and isolated to the sternal and vertebral ends of ribs (Figure 4.5). These types of injuries tend to result from direct blows to the chest or anterior compaction that have been associated with occupational injuries as well as assaults (Galloway et al., 2014). Given the lack of periosteal reaction, they may have occurred during institutionalization. For all rib groups, the left side was more likely to be impacted by a nearly 2:1 margin.

Rib fractures were also assessed for location patterns (Figure 4.6). Fractures of the upper three ribs are the least common in clinical literature, and are associated with catastrophic injury from falls or assaults. Due to their proximity to the vasculature of the upper thoracic cavity, they

are also associated with greater fatality risks, ranging from 4-20% (Galloway et al., 2014; p 190). Stress fractures of the first rib may also occur as a result of strenuous overhead activity, which usually occurs in the middle third of the rib (Galloway et al., 2014; p 191). Interestingly, 11% of rib fractures occurred to the 3rd rib, making it the second most frequently fractured rib in the study sample.

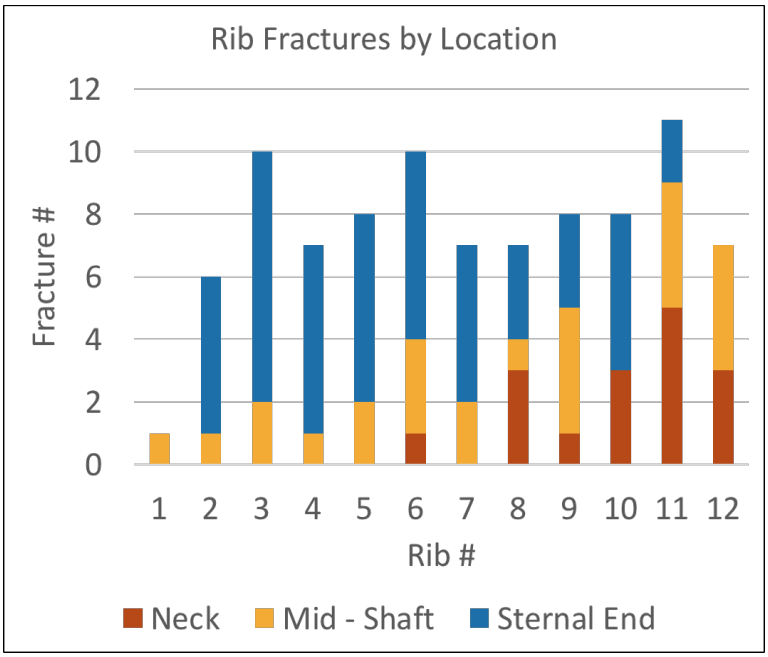


Figure 5.7: Rib fractures by location.

The fourth through ninth ribs are typically the most frequently fractured, and injuries to this area often involve multiple ribs, depending on the focus of the force. This pattern did not hold in the study sample, however, with relatively high fracture frequencies in the upper and lower ribs as well. A majority of fractures occurred to the left side (61.50%). Higher ribs tended to fracture toward the sternal end, and fractures to the neck were only observed in the lower ribs.

Fourteen individuals (77% of those with fractures) had multiple rib fractures, with four individuals having more than twelve total rib fractures. (Table 5.3) Injuries that result in

No. Rib Fx	Male	Male +	Female	Female +
1	3	1	0	0
2	1	3	0	0
3	0	0	1	0
4	0	1	0	0
5	0	1	0	0
6	0	0	0	1
7	0	1	0	0
8	0	0	1	0
9	0	0	0	0
10	0	0	0	0
11	0	0	0	0
12	0	1	0	0
13	0	1	0	0
14	0	0	0	0
15	1	0	0	0
16	0	1	0	0

Table 5.3: Number of rib fractures differentiated by sex. (+) represents individuals with rib injuries as well as trauma to other bodily areas.

multiple rib fractures are often caused by compressive forces, and the area of fracture is dependent on the direction of force. Low impact forces of compression from indirect trauma rarely cause a fracture in the point of application, leading to oblique fractures in the lateral portion of the rib, whereas high impact forces cause fractures at the point of compression, resulting in a transverse fracture (Galloway et al., 2014; 190-191). Transverse fractures are usually produced by direct blows to the area, and oblique fractures are more often associated with falls from a height. Due to the lateral curvature of the ribs, when an oblique fracture occurs, the newly fractured can penetrate the soft tissue, leading to further injury (Morgan et al. 2022). If the ribcage is compressed anteroposteriorly, the fracture occurs to the most lateral point of the ribs, along the mid-shaft. The necks of ribs are more likely to fracture if a source of compaction is directed anteriorly toward the spinal column. Lateral compaction yields fractures to the neck and sternal end of ribs (Galloway et al., 2014; p 190; Morgan et al. 2022).

Pelvic Girdle and Lower Limbs

The pelvis consists of the sacrum and the right and left os coxae, each of which is composed of the ilium, ischium and pubis. Causes of fractures to this region of the body range from falls from heights to high-impact collision, impacting the soft tissue structures of the pelvic cavity. Activity-related causes are a factor in the age distribution of pelvic fractures, however their incidence also occurs more frequently with increasing age (Galloway et al., 2014; p 246, Ghosh et al 2019).

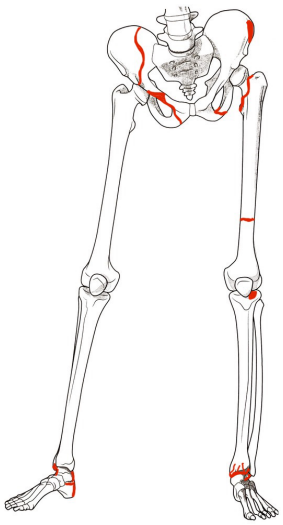


Figure 5.8: A composite diagram of the pelvic girdle and lower limb trauma, with healed injuries depicted in dark red.

Four older adult males and one young adult male exhibited injuries to the pelvis. Fractures to the iliac wing are the most common fracture site, caused by muscle pulls. One individual had a well healed s-shaped fracture of the iliac wing consistent with a Duverney's fracture, which is associated with compressive forces from a lateral direction (Galloway et al., 2014; p252). Two injuries to the pubis were recorded, one affecting the area where the iliopubic ramus extends from the acetabulum to the inferior margin of the public symphyseal face, and the other consisted of a straddle fracture to the ischiopubic ramus. Both injuries are associated with moderate to severe trauma (Galloway et al., 2014; 246-147).

The lower limbs consist of the femur, patella, tibia, fibula, talus, calcaneus, tarsals, metatarsals, and foot phalanges. There were seven individuals with injuries to the lower limbs. The femur is the longest, strongest, and most heavily mineralized bone in the human body. One older adult male exhibited a fracture to the femoral neck, notably the most vulnerable area of the femur as the junction of the hip joint and most prone to fracture. Fractures to the neck are commonly associated with low-impact falls in the elderly, and their incidence increases with age (Bäcker et al 2021, Galloway et al., 2014; p 265). Fractures of the femoral shaft are common in young and adult males, and are associated with considerable forces that result from falls, activity-related injuries, and high-speed collisions (Salminen et al., 2000). One young adult individual exhibited a complete transverse fracture to the distal third of the shaft.

The tibia is the most weight-bearing bone of the lower limb, articulating proximally with the femur, patella, and fibula to form the knee joint and distally with the fibula and talus to form the ankle joint. Five tibial fractures were present, with fracture types resulting from stress and fatigue the most common. Two depression fractures to the lateral condyle on the tibial plateau were observed. These are the result of compressive forces of the femoral condyle and associated with heavy biomechanical loading (Galloway et al., 2014; 277).

Three fractures occurred to the distal tibia joint surface resulting in the avulsion of the medial malleolus, with two resulting in severe comminuted fractures. Most fractures to the distal articular surface occur while the foot is in contact with the ground. Fractures to the anterior margin of the distal tibia (n=2 in the study sample) are commonly associated with ankle injuries that result from supination-external rotation movements (Galloway et al., 2014; p 282). These forces are also associated with avulsion fractures of the medial malleolus. A study on the incidence of tibial

fractures in the Swedish fracture register found that injuries to the distal tibia were the least common, and were mostly attributed to individuals in younger age cohorts (Wennergen et al 2018).

There were several injuries to the ankle, involving multiple skeletal elements. These included a ‘snowboarder’s ankle’ fracture to the lateral process of the talus of one individual caused by the inflection of the ankle and a ‘Shepherd's’ fracture to the talar process of the calcaneus which is caused by forced hyperplantarflexion. A comminuted pilon fracture to the distal tibia was also observed in an individual with a co-occurring fracture to the lateral malleolus of the fibula, as well as the calcaneus. The large fragments along the anterior margin suggest high-impact forces such as a fall from a height or otherwise greater loading, and the avulsion fracture to the medial malleolus of the fibula along with the depression fracture of the calcaneus indicate compressive forces such as a fall from a height onto the feet (Galloway et al., 2014; 290, 298). Injuries to the foot are prevalent amongst individuals with high-activity lifestyles as well as with increasing age, commonly occurring from low-energy impacts (Rasmussen et al. 2021).

5.5: Conclusion

The results of the overall demographic assessment of the sample by age and sex revealed an overwhelming majority of male individuals, who were more likely to exhibit trauma than females. The prevalence of trauma was found to be statistically significant in comparison with two contemporaneous institutions. The most prevalent fracture site was the ribs, with the cranium and lower limbs following. Over 70% of individuals with traumatic injuries, had injuries to more than one body area. In the next chapter, I discuss these results in social and historical context.

Chapter 6: DISCUSSION

6.1 Introduction

Differentiating between accidental or occupational injuries and trauma caused by interpersonal violence is important for understanding the hazards encountered by individuals in a particular historical context. The association between observed traumatic lesions and injury experience can be explored through their contextualization with relevant historical information and the previous research specific to the institution's admissions records. The presence, etiology, and frequency of traumatic injuries observed in this study sample is primarily consistent with patterns of accidental occupational injuries, such as falls or kicks from draft animals, likely reflecting the hazards of mining, farming, and even institutionalization that many of these patients faced (Redfern 2017, Pérez 2016). To demonstrate this, I present an osteobiography of Individual B-10 whose skeleton reflects strenuous labor and injuries likely related to the hazards of this western frontier context. Then, I discuss the prevalence and distribution of injuries in the study sample in comparison to contemporaneous samples. Finally, I contextualize the injuries in terms of interpersonal violence, occupational and activity related injuries, as well as injuries indicative of the effects of aging.

6.2 Osteobiography of Individual B-10

Individual B-10, an older adult (60+) male was chosen for an osteobiography (a biographical sketch based on skeletal data) in order to engage in an individual analysis that better captures the relationships between traumatic injuries and other intersections of identity and experience than solely a composite analysis of trauma by body location (Hosek and Robb 2020).

In order to estimate the age and sex of this individual, a total analysis using all available methods was operationalized. For the age estimation, the Suchey-Brooks pubic symphyses were assessed for degenerative changes along with the auricular surface of the ilium and the sternal rib

ends. The ranges for these estimates were 35-60+ years old, 50-60+ years old, and 65-78 years old, respectively. Due to the fragmentary nature of the cranium, the element was not used in order to derive a skeletal age estimation, however the sutures mostly showed fusion to complete obliteration. Taken together, because of the degenerative changes, this individual was conservatively estimated to be over 60 years old. For the sex estimation, it was still possible to do a complete analysis of the elements of the cranium as well as the pelvis. Lacking hyper feminine traits such as the ventral arc and preauricular surface, the overall shape of the pelvis exhibited characteristics ranging from indeterminate to hypermasculine. For the cranium, the overall shape and structure of the brow was prominent, and so was scored as hyper masculine. This was also reflected in the nuchal crest. The pertinent features of the mandible were not present, and so were not included in the analysis. Further, the humeral and femoral head diameters (Stevens 1979) were scored with values in the 'male' category. Thus, this individual was estimated to be a male over 60 years of age.

This person exhibited multiple traumatic injuries and pathological conditions, some of which were in active stages of healing at his death. These include two instances of crushing rib injuries (several of which were healing at the time of death), a fracture to the iliac wing, and a Le Fort III fracture to the maxillary complex. All of these injuries were described individually in Chapter 5, but it is important to see how injuries in different body locations may be related to each other and to other skeletal markers in one person's body.

Individual B-10 was exhumed in the 1992 excavation, and had several missing elements (Figure 6.1), however a complete age and sex estimation was possible. The cranium was fragmentary, and there were several trowel marks to the vault. Most of the bones of the face were present, however the nasals, left zygomatic, and the body of the mandible were missing

postmortem or badly damaged. The maxilla itself was fragmented but present, and completely edentulous showing evidence of porosity, advanced alveolar resorption and remodeling.

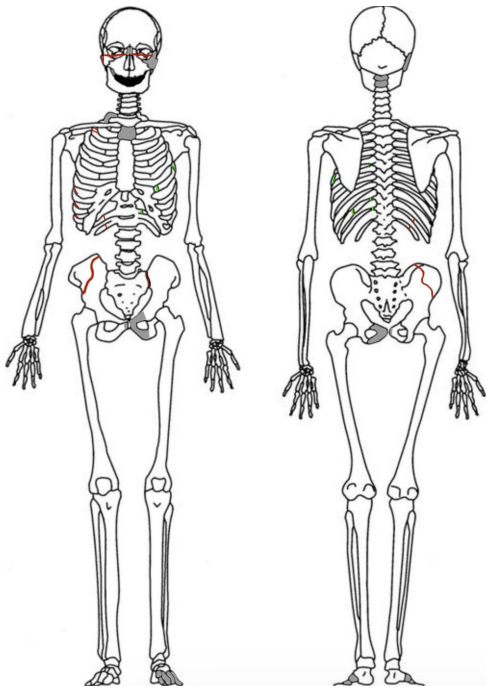


Figure 6.1: Healed injuries are depicted in red, and the healing injuries are depicted in green (and isolated to the ribs). Missing elements were colored in with gray.

Moderate diffuse osteoarthritis was observed throughout the skeleton, with the highest degree of severity in the vertebral segments and the pelvis. These degenerative changes were indicated by macroporosity and osteophytic activity surrounding the joint surfaces. Entheseal changes or bony growths that occur at the sites of ligament and tendon insertions have been linked to activity-related musculoskeletal stress as well as individual health and age-related factors (Becker 2020; Villote and Knüsel 2013). Enthesopathies were found on each scapula, humerus, radius, ulna, innominate, the right femur and the right tibia. Allan's fossae of the femur and squatting facets of the distal anterior tibia were also present. The humeri were bowed medially at mid-shaft, and asymmetrical in length. The high frequency of entheseal changes to multiple body areas and degenerative changes to facets (including those associated with specific activity patterns

such as squatting) suggests repetitive stresses linked to strenuous activities (Becker 2020). These skeletal changes suggest that this individual performed strenuous labor that impacted his body over the course of his life, resulting in likely joint pain throughout his later years.

The pelvis presented an excessive amount of wear and tear. The sacroiliac joint was nearly fused on the left side, and there were bilateral facets and elongations of the acetabulum at the hip joint. He also exhibited a Duverney's fracture to the right iliac wing, which is due to lateral compressive forces. A rare congenital disorder, spina bifida occulta, resulted in the failure of the neural arches to develop in the inferior segments of the sacrum, although this likely caused no health issues during life.

There were seven well-healed fractures to the right side of the rib cage, and six healing fractures to the left side of the rib cage. Many of the healing fractures featured active patches of periostitis (initial callus formation) surrounding the break and gave the appearance of the initiation of woven bone formation. Those that were in active stages of healing also contained fragments displaced viscerally, which invite the opportunity for soft tissue damage to the thoracic viscera, and are marked by elevated morbidity and mortality in the clinical literature. The potential biomechanical causes of this individual's injuries are falls, interpersonal violence, high speed collisions, and mechanical loading stresses.

It is important to see these injuries beyond their immediate bodily location in order to consider how injuries that occurred over an individual's lifespan can indicate particular instances of interpersonal relations leading to acts of violence, or a life of labor and activity. When taken together, this individual's injuries and evidence of degenerative joint disease indicate repetitive strenuous activity in conditions that introduced a variety of environmental hazards, fitting the occupational patterns of patient admissions. While we cannot with any certainty identify his

occupation, it is clear that he participated in active, strenuous labor over the course of his life and may have been one of the many miners, farmers, or laborers admitted to CSH. His healed injuries further demonstrate the hazards associated with life experiences for men in 19th-century Colorado. Given the active healing in the injuries associated with the compression of the rib cage, it is possible that this event was a cause of, or resulted from, this individual's institutionalization. In other words, this injury may have occurred while he was in the asylum under 'care'. It is indicated in the Biennial Reports that a notable number of patients died as a result of their trip to the asylum, without a specificity to their overall well-being or health status.

6.3 Prevalence and Distribution

In James' (2023a) study on the paleoepidemiology of the entire skeletal sample, 68% of the population had evidence of at least one traumatic injury, which is consistent with the findings of this preliminary study into trauma patterning (67.5%). For individuals whose sex could be assessed, likely male individuals composed of 67.1% of those exhibiting evidence of traumatic injury. I speculate that the gender disparity represented in this subsample reflects the patterns of male to female ratios in asylum admissions

Individuals with fractures had significantly higher prevalence in the CSH sample than in the Oneida County Asylum and the Milwaukee County Asylum. Sutton (1991) notes that the asylum model functioned best in states with well-established governments that accommodated charity and welfare systems. The institutions in Wisconsin and New York were opened after regional industrialization and urbanization, rather than alongside these processes and may have benefited from better funding and different source populations. Labor and occupational

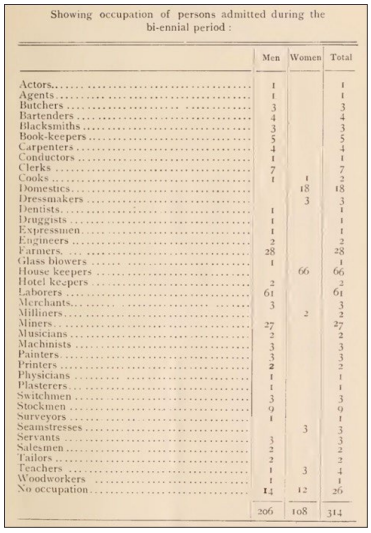
opportunities in these areas also differed from Colorado where mining played a significant economic role.

According to modern clinical data, an individual's risk for traumatic injury is increased when subjected to conditions of poverty, economic inequality, and hazardous environmental conditions (Dittmar et al. 2021, Redfern 2017, World Health Organization, 2020). Many of the individuals who experienced introduction into the asylum system were in an already vulnerable position, as state provisions of care were required. The majority of occupations held prior to institutionalization were correlated with gendered positions of typically lower skill and lower income. Men were admitted to the institution more frequently, and also more likely to remain institutionalized. Approximately 20% patients had diagnoses of intemperance at the time of admission, representing a large number of individuals who would go on to be discharged. Admission to the asylum for individuals with intemperance was oriented on sober rehabilitation (Magennis & Lacy 2014). This was not the case for many individuals, however. Those with chronic cases of 'insanity' were retained, in many cases until their deaths. Between the 1879-1989 period, 42% of individuals died while institutionalized. As the population of Colorado grew, so too did the volume of individuals requiring care. This had drastic effects on patient experiences, and is exhibited by the investigation into, and eventual resignation of, the superintendent in 1898.

6.4 Accidental Injuries and Occupational Hazards

The types of occupational and local hazards that these individuals may have faced are also hinted at in the changing landscape of Colorado and the city of Pueblo. Most of the injuries in this sample are attributable to accidental injuries associated with high-risk occupations such as with agriculture and mining. According to Magennis and Lacy (2014), the majority of admitted men

worked in agriculture and livestock, mining, and machining, and women worked in domestic positions (Figure 6.2). Gender-based behavioral expectations and occupational hazards reflect a higher incidence of traumatic injuries for males. Men held positions such as laborers, farmers, and miners, and the overwhelming majority of women were housekeepers. There was an extensive amount of crushing injuries to the limbs, vertebrae, and ribs in this sample, many of which can be associated with high-energy, high-impact forces in accidental occupational injuries (Dogan & Demerici 2011, Gilmour et al. 2015).



Showing occupation of persons admitted during the bi-ennial period :

	Men	Women	Total
Actors	1		1
Agents	1		1
Butchers	3		3
Bartenders	4		4
Blacksmiths	3		3
Book-keepers	5		5
Carpenters	4		4
Conductors	1		1
Clerks	7		7
Cooks	1	1	2
Domestics		18	18
Dressmakers		3	3
Dentists	1		1
Druggists	1		1
Expressmen	1		1
Engineers	2		2
Farmers	28		28
Glass blowers	1		1
House keepers		66	66
Hotel keepers	2		2
Laborers	61		61
Merchants	3		3
Milliners		2	2
Miners	27		27
Musicians	2		2
Machinists	3		3
Painters	3		3
Printers	2		2
Physicians	1		1
Plasterers	1		1
Switchmen	3		3
Stockmen	9		9
Surveyors	1		1
Seamstresses		3	3
Servants	3		3
Salesmen	2		2
Tailors	2		2
Teachers	1	3	4
Woodworkers	1		1
No occupation	14	12	26
	206	108	314

Figure 6.2: Occupations of persons admitted during the biennial period: 1887-1888. Courtesy of the Pueblo County Library.

The underground mining, steelworking, and agricultural industries of Colorado developed rapidly. In addition to the environmental hazards of migrating to the high country of the Rocky Mountains, miners and steelworkers faced extremely hazardous labor conditions. Underground explosions, mine collapse, collisions with mine cars, falls, and poisonings were reported between the years 1864 and 1914, most of which resulted in multiple fatalities and injuries (Fay, 1916).

Farmers and livestock handlers would have encountered similar hazards, however high-impact forces resulting in traumatic injuries may have come from falls and kicks from draft animals (Redfern 2017, Scott et al 2019). Ranching and farming also rank highly today among fatal and

non-fatal occupational injuries, and agriculture has a fatality injury rate 8.5% higher than all other occupations combined. Feeding, rotational grazing, care, riding, corralling, and butchery are all activities which require livestock workers to handle animals that can reach over 2,500 pounds. Specifically, cattle related injuries are most frequent (Dogan & Demerici 2011). The semi-arid climate of the eastern plains offers a considerable amount of prairie grasses for cattle grazing. The risks of accruing traumatic injuries for livestock workers were increased especially for young adults engaged in riskier labor or older adult male individuals who had experienced hearing loss, overwork, or were suffering from joint disease.

Women in Colorado experienced a higher level of vulnerability to physical health concerns, most likely due to the lack of equitable payment and employment opportunities (James 2023a). The primary occupation for women was 'housekeeper', and around 73% of women were listed as having an occupation. Of those whose occupations were not listed, many were accompanied by diagnoses for 'dissipation', appearing to be code for 'prostitution' (James 2023b). A majority of domestic servants in Colorado at this time were young migrant women of low socioeconomic status. Most individuals in these positions 'lived in' with their employers, available for labor at any time of day (Richards 2002). There were a total of nine likely female individuals in this study, with 4 instances of injuries. Due to the small representation of individuals in this sample, it is difficult to consider patterns of injury. However, one young adult female exhibited a load-bearing stress fracture to the distal tibia. Injuries associated with gendered tasks in domestic duties are associated with low-energy 'underfoot' injuries (Gilmour et al 2015).

Once admitted, individuals would have encountered similar occupational hazards on account of the kinds of jobs patients were employed to complete. Whereas women were employed in domestic duties like sewing, cooking, cleaning, and laundering, men aided in the maintenance

and construction of the farm and additional buildings. Citing the apparent need for rigid economy and the instantiation of patient labor in order to sustain the asylum's needs, Dr Thombs reports in 1896 that the asylum's farm produced 14,000 gallons of dairy, raised 50 hogs, 175 chickens, and produced at least 300,000 lbs worth of produce that sustained the population (Thombs 1896). In addition to the mortality, financial, and administrative data, on a few occasions he made note of injuries in his Biennial Reports from the construction of the asylum, machining accidents, and the livestock on the farm. As such, we can presume that some of the injuries identified in the skeletal remains from CSH may have occurred during institutionalization.

6.5 Interpersonal Violence and Abuse

There were five fractures to the craniofacial area and two in the mandible in the study sample. Several occurred to individuals with multiple affected body areas (Crandall et al. 2004, Novak et al 2009, Wu et al 2010). Head injuries in adults are most often sustained in high-impact collisions with a blunt surface, such as falls from a height. The craniofacial injuries, however, suggest some possibility of violence as these types of injuries tend to occur during interpersonal encounters in which the face is a particular target (Redfern 2017). The nasals were the most common injury to the face, following with the maxilla (Redfern 2017; p 110). Interestingly, no trauma to the cranial vault was identified in this sample. Four individuals also exhibited fractures to the metacarpals that were associated with falls or striking blows with a clenched fist.

Rib trauma accounted for ⅓ of all fractures for males and nearly ⅔ for females. Three male individuals had multiple rib fractures at different stages of healing, several falling within the category of perimortem injuries. The perimortem rib fractures were isolated to the sternal and vertebral ends of ribs, and were transverse. Trauma from falls and lower impact forces do not

typically result in transverse fractures to the sternal or vertebral ends of ribs. Rather, these injuries are due to direct blows to the chest, or the anterior compaction of the thorax. Both of these etiologies are related to occupational injuries as well as assaults from situations of frontal violence (Galloway & Wedel 2014; p 190). Given the lack of healing in these injuries, it is possible that they were accrued during institutionalization.

Overcrowding and relative lack of staff was a hallmark of the early decades of CSH with a patient to staff ratio of 36:1 by 1898 (Thombs 1898). Untrained and overworked individuals were employed to watch over patients, but not to treat them. Use of physical force and mechanical restraint was reported, and the crowded wards were full of patients suffering from different manifestations of mental and physical illnesses, with symptoms ranging from mild to severe. Fights among patients, forceful physical restraint, and violent outbursts are hinted at in the biennial reports as well as witness accounts in newspaper articles related to the investigation in 1898. As it became difficult to control patients, attendants would isolate them for long periods of time (Thombs 1886). These conditions may have led to injurious physical encounters amongst patients, or between patients and staff.

Falls due to increasing age are a leading cause of trauma in elderly individuals. “Older Adults” accounted for 35% of the individuals in the sample, 87.5% of which exhibited one or more fractures. Besides the extensive rib fractures, fractures to the limb bones and pelvis were common, including severe fractures to the pubis and ilium. Out of five separate injuries, four were observed in older adult males. Injuries to the upper extremities, maxillofacial area, and the lower extremity/torso are most frequently reported in cases of elder abuse (Redfern 2017). Older adult males were the most likely to remain institutionalized at Colorado State Hospital. The most frequent causes of insanity attributable to this cohort were ‘senility’ and ‘dementia’. Many

neurodegenerative conditions appear with increasing age, and cognitive impairments are the largest risk factor for injuries of elderly adults in the modern clinical literature (Fernando et al 2017).

Hip injuries have been associated with structurally underfunded institutions of care in both historic and contemporary contexts (de la Cova et al. 2023). One older adult male individual exhibited a hip injury involving both the neck of the femur and the iliac wing, which are consistent with falls and severe impacts to the soft tissue and joint mobility. (Colles Fx) The increased risk of fracture with age, accompanied by the marginalization experienced by elderly adults demonstrates the ways that overlapping vulnerabilities may have put them at higher risk of falls and potentially elder abuse.

6.6 Conclusion

Demographic distributions of trauma and analyses of injuries by body area demonstrate to what extent different cohorts of individuals presented with different patterns of traumatic injury. Ultimately, patterns of increasing age-related risk were evidenced by the etiology of fractures as well as the demographic groups affected by these injuries. The trauma in this preliminary sample fits patterns of occupational injuries and interpersonal violence, signifying the hazards of mining, farming, and institutionalization.

Chapter 7: CONCLUSION

7.1 Summary

The extensive amount of trauma experienced by individuals in this 19th-century institutional context reflects the intersections of inequitable frontier political economy, rapid industrialization, and their impacts on the most vulnerable members of society. Male individuals were more at risk of institutionalization than females, and were predictably more represented in this study sample. Displaying fracture types consistent with heavy manual labor and high-impact forces, this group of individuals likely encountered the greatest degree of physical hazards. Although there is a probable gendered difference in the hazards encountered by each sex, the proportion of female individuals in this study was significantly lower than in James' (2023a) study and the admissions records. This sample is likely indicative of the frequency of trauma in the wider

population, however, as James' (2023a) study accounted for the presence of trauma in the entire skeletal sample and the frequencies by sex were very similar. Importantly, this study represents a far more extensive and detailed analysis of trauma than James (2023a), despite the smaller sample size, and will form the basis for future detailed trauma analysis in this collection.

There were several limitations to this work. In all archaeological contexts, there is always some degree of missing data when it comes to population-level research on collections of human remains (Whistler et al. 2022). Preservation, mortuary context, excavation practices, and myriad other factors dictate whether or not an individual makes it into a given collection. Although the evidence of traumatic injuries can be representative of injuries sustained during life, the underrepresentation of soft tissue injuries in bone can exclude many different forms of trauma. A sample size of forty individuals is likely to misrepresent to some degree the distribution of traumatic injury patterns among the entire population. Further, the individuals included were not from an entirely random sample. Some individuals were chosen randomly based on their completeness, and some were chosen sequentially according to burial number. The collection of data was also dependent on time constraints. In light of this, counts of individual injuries may change drastically when the full analysis of trauma patterning in the collection is completed.

The exact numbers and identities of individuals who were buried at Colorado State Hospital is unknown. According to the admissions records, there were as many as approximately 500 deaths during the 1879-1898 period (Magennis & Lacy 2014). The skeletal collection associated with cemetery 2 consists of at least 155 of these individuals. It is possible that there are temporal or demographic patterns that are completely unrepresented by those individuals made available for analysis. In the archaeological site report, it was confirmed by GIS that there are more burials surrounding the initial excavation sites (Painter 2002). Additionally, some of those who died

within the institution during this period were claimed by family members and buried elsewhere according to their wishes.

A second difficulty came in the way of making intra-site comparisons. It is generally discouraged to compare results to populations that were assessed using different methods to make age and sex estimations. Further, many trauma studies may not differentiate between the descriptive characteristics or incidence of injuries to specific body areas. As trauma pattern analyses continue to grow in popularity, cross-site comparison may result in the ability to glean further insights into the mechanisms of social and environmental hazards on individual and population levels of injury accrual.

7.2 Future Research

This thesis dealt directly with the mechanisms and patterns of injury. The results of this preliminary investigation into the injury patterns revealed that many individuals experienced potentially disabling and life-threatening injuries. Most of the trauma in this sample was well-healed, suggesting that individuals would have lived under these conditions for a long time. Future trauma analyses would benefit from including radiographic evidence of fractures to determine more precise estimations of the timing and type of injuries. Studies into segments of the collection at Colorado State Hospital have included approaches such as feminist disability theory and intersectionality (Atwell 2022). Moving forward, I believe that after a complete analysis of the fracture pattern analysis is done, a population and osteobiographical approach through the bioarchaeology of care model would reveal more about the experience of individuals prior to and during institutionalization. Further, it would be an interesting approach toward thinking in terms of ‘care’ in the context of the asylum model with connotations that are usually positive, perceived to be health or wellness-promoting.

The bioarchaeology of care approach is a kind of osteobiographical platform that has emerged as a methodological contribution to the exploration of embodiment and identity by focusing on the individual experience of disability or disease (Hosek & Robb 2019; Tilley 2017). Tilley (2017) developed a methodological approach for the investigation of individual disease or disability experience. First, information with regard to the individual's unique information (such as age, sex, pathological lesions, and any other available historical or contextual data) is gathered. The researcher then considers the possible clinical and functional impacts of the individual's disease as well as their lifeways. Using this information, a model of care based on the perceived impacts of the disease is developed. Finally, the researcher examines the model of care, by considering the feasibility of the model of care in light of what is known about the individual and the mechanism of care.

As indicated by the known history of the Colorado State Hospital, this institution consisted of many individuals with diagnoses of paralysis as contributing to their cause of 'insanity'. Some individuals in this sample accrued little to no life threatening (skeletal) injuries, although in several instances, individuals accrued injuries to over three different areas of the body. Many of these injuries would have had lasting consequences on the individual's daily activities such as labor or self-care. Applying the bioarchaeology of care model would help to elucidate some of the narratives that may be missed by only considering injuries and their consequences quantitatively, or only in relation to the immediate circumstances of death. It may also stand to reframe the discussion that is currently centered on the intersections of labor, political economy, and suffering to include other kinds of care models and kinship formations.

Finally, I recommend that further research be done in collaboration with a stakeholder community, or board of ethical responsibility. Until recently, there has yet to be a legitimate

initiative to consider what a stakeholder community associated with the remains from the Colorado State Hospital may resemble. It is possible that through the continued research into the lives of individuals who died in this institution, a form of descendant community may be achievable by contacting historical associations throughout the state of Colorado. Alternatively, a board of ethical responsibility with diverse representation for underserved descendant communities may result in a more productive discourse on the provenance of these individuals remains. Continuing to remain updated with the current ethical regulations of pertinent academic and anthropological research associations such as the AABA [American Association of Biological Anthropologists], AAA [The American Anthropological Association], and Smithsonian Institution are considered best practices. Considering the wealth of valuable insights into successful community projects such as the New York African Burial Ground Project may also provide some guidance in the processes of identifying stakeholder communities (Blakey 2022).

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