THE EMERGENCE OF RELATIONALITY: THE ONTOLOGY OF PERSONHOOD AND AGE-BASED IDENTITY IN THE MORTUARY PRACTICES OF ARCHAIC INDIAN KNOLL, KENTUCKY

by

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DEDICATION

This is for everyone who was there through it all. For my family, who supported my love of anthropology and archaeology from a young age and have continued to support me throughout my academic career. For my friends, or rather my second family, who always surrounded me with love and acceptance through both the highs and lows of these last few years and reminded me every day to always be myself. And for those who love and watch over me; those I've come to know, those who've gone, and those I've yet to meet. Thank you.

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ABSTRACT

THE EMERGENCE OF RELATIONALITY: THE ONTOLOGY OF PERSONHOOD AND AGE-BASED IDENTITY IN THE MORTUARY PRACTICES OF ARCHAIC INDIAN KNOLL, KENTUCKY

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This thesis examines the embodiment of biosocial age identity in the mortuary practices of the Late Archaic site, Indian Knoll (ca. 4600-3500 BP), in Kentucky. Utilizing bioarchaeological biosocial approaches and mortuary theory, the mortuary practices of Indian Knoll inhabitants were examined to determine persistent practices of biosocial mortuary identity, in which the embodiment of age-based identity is attributed to the cultural ontology of personhood. Lower mandibular radiographs were used to conduct biological age assessment on a preadult sample population in order to establish maturity-based dental age rather than chronological age assessment. Burial positioning, orientation, interment number, and grave good presence were compared across site between biological age groups. High correlation in burial form between biologically immature and mature individuals demonstrates that social identities were ascribed early in life in association with like-status individuals and reinforced over the life course. The inclusion of specific grave goods in select burial contexts emphasize hunter-gatherer

identities across the mortuary landscape, which suggests that Indian Knoll biosocial identities revolved around inherent ontological relationships with non-human agents that are negotiated through persistent socioecological interactions throughout Indian Knoll's occupation.

CHAPTER ONE: THE ONTOLOGY OF PERSONHOOD AND REPRESENTATION OF AGE IN BIOLOGICAL ANTHROPOLOGY

Human identity is a multivariate concept in which cultural, physical, and personal characteristics are expressed through personal and group interactions to relate ideals of the individual, community, and cosmological presence. While constructed and perceived in numerous methods across cultures, human identity draws upon both physical and social experiences in which the individual embodies assigned meanings over the course of their lifetime. Identity is not static. Human identity is continuously negotiated using the reconstruction, organization, or maintenance through relations between social agents, both living individuals and the dead (Goodenough 2004; Knudson and Stojanowksi 2008; Zvelebil and Weber 2013).

Age has been utilized across human culture as a primary component in establishing identity. Whether defined through empirical measurements of time or by abstract concepts, humans have consistently negotiated identity over the life course. Age has also pertained to other concepts of lived experiences, such as the stages of biological development or the inherent "progression" of a defined entity, whether a living individual or the perceived growth of a social organization (Bogin 199l). Age, while seemingly a universal concept, has different implications and meanings depending on the cultural perception of age-based identity (Justice 2014; Lewis 2007; Sofaer 2006). Nonetheless,

as a core component of human life history, age is cemented in anthropological paradigms as a distinguishing factor in the scientific analysis of human culture.

Bioarchaeology has since reoriented its paradigms to incorporate biocultural methods in investigating the embodiment of age through the comparison between the treatment of human remains in mortuary contexts and the social, symbolic, and ideological traits assigned by cultural participants over the life course. Anthropology's "ontological turn" focused on questions of human ontology, or the methodological investigation of the recognition and development of "being" or "presence" (Astor-Aguilera and Harvey 2018; Jacquette 2002). Specifically, bioarchaeology has utilized biocultural methods, such as mortuary analysis, to examine relationship between biological experiences and the attainment of cultural autonomy, or the ontology of personhood (Justice and Temple 2019a; Jacquette 2002; Zuckerman and Armelagos 2001). Here, social ontological beliefs integrate both biologically and culturally specific variables to establish social systems of agency, whether through direct interaction between social agents, or through transitional life experiences that correlate with physiological life phases and ideological structure (Deverenski 2000; Glencross 2011). Social ontology, therefore, is presented in mortuary contexts through the reconstruction and creation of social identity via the treatment of human remains.

This thesis will investigate the ontological development of Late Archaic hunter-gatherers from the Indian Knoll (15Oh2) burial mound in the Green River Valley, Kentucky. The goal of this work is to present evidence that social maturation can be identified in the burials of preadults, and thus argue that a biosocial life history approach

can be used in bioarchaeological investigation to answer questions of human ontology. Early life development is a crucial period in individual life course where the attainment of individual and communal identity is contingent on integral relations between sociocultural environments that are embodied through the ageing process. Biosocial experiences are therefore presented in mortuary contexts, both in phenotypic variation and the construction of persistent identity through the treatment of skeletal remains. The significance of this research centers on the idea that human aging is a biosocial phenomenon, in which the physical presentation of aging is the direct result of cultural expectations of individual agency and sociocultural settings experienced during early life course development.

The remainder of this chapter will discuss the concepts and definitions used in bioarchaeological studies of age and the ontology of personhood, as well as the theoretical approaches behind the study of cultural mortuary practices. Chapter 2 will discuss the study of preadults in biological anthropology and the application of biosocial approaches to preadult populations in past societies. Chapter 3 will introduce background information and materials used from the Indian Knoll site and review the methods used for dental age estimation and mortuary analysis. Chapter 4 presents the results of the qualitative comparisons and statistical analyses of mortuary data and dental samples, including patterns in mortuary treatment and observations of dental development in Indian Knoll preadults. Chapter 5 discusses the results of the prior chapter and how Indian Knoll mortuary practices embody ideals of ontological social

maturation. Chapter 6 provide a comprehensive review of this thesis and concluding remarks of the case study findings.

Concepts of Personhood and Age

The Ontology of Personhood

The study of ontology stems from philosophical questioning of the nature of "being" and relational "beings," or the study of ethical concepts of existence, being, or reality(s). The ontology of personhood, therefore, is the examination of "personhood." "Personhood," in the context of social sciences, is defined as the recognition and awareness of the "self" or agency. Subsequently, the use and prescription of the term "person" follows the recognition of the social presence (Goodenough 2004; Prust 1997; Walsh 2021). Anthropological interpretations of person, however, prioritized "personas" in the form human social behavior. Initial ontological studies in anthropology followed established Platonic-Cartesian ideals of human action and "being," where theories of human social behavior emphasized the presence of rationale such as the capability to articulate language and thoughts, as these forms of actions were perceived as demonstrating critical thinking and intellect (Astor-Aguilera and Harvey 2018; Farnell 2012; Walsh 2021). However, individual actions and emotional expression were not accepted as equal presentation of personhood. Early anthropological theories adhered to dualistic approaches to human evolutionary behavior, in which human physiology was conceptually separated from social behavior on the basis that the body retained innate influence from evolutionary mechanisms rather interconnected to social and cultural environments (Csordas 1990; Farnell 2012).

Dualistic concepts of body and culture persisted until the beginning of the 20th century with the introduction of structural-functionalism and the incorporation of sociopsychological methods in the study of human variation. As espoused by several scholars, such as Max Weber, Marcel Mauss, and Emile Durkheim, the physical body was incorporated into anthropological observations of cultural behavior through the study of *habitus*, or the set of dispositions that indicate patterns of actions. In other words, the body now composed a "social object" that dictated various forms of human action, including the varying degrees of all cultural and social behaviors (Crosley 2013l; Csordas 1990; Durkheim 2005; Farnell 20120). Embodiment theory recognized that personal actions range between modes of "specialization," or that human movement fell into specific modes of attainment. The most basic actions are those acquired throughout the life course, including unconscious actions, such as walking, hand gestures, sitting, speaking, and other daily actions. "Choreographed" or skilled movements included those pertaining to professions, modes of communication, and expression of identity that follow specific norms or ideals that are learned and negotiated throughout the individual life course. Whether "natural" or skilled, all bodily actions originated from cultural and social learning experienced during early life development, and, through persistent action, that represent unified, complex functions to both express both individual agency and group cultural ideas (Csordas 1990; Durkheim 2005; Farnell 2012; Mauss 1979; Ogden and Wakeman 2013). In other words, the recognition of the dualistic roles of body actions created a sense of the "dynamically embodied person" in anthropology (Farnell 2012).

Primary theories of embodiment, however, maintained a society-body dichotomy by viewing movement as "practical knowledge," or that human actions and habits are functional result of social learning and principles established through group interaction (Crossley 2013; Durkheim 2005; Farnell 2012; Mauss 197). Bourdieu (1980) began to deconstruct prior understandings of *habitus* by implementing an actor-centric view of human action instead of an objective-behavioral perspective. In Bourdieu's mind, *habitus* entails the acquirement of underlying dispositions of how an individual should act or behave; however, it does not override individual agency in process of movement-based decision making. According to Bourdieu-Wacquant (1992), "I wanted to account for practice in its humblest forms – rituals, matrimonial choices, the mundane economic activity of everyday life etc. – by escaping the objectivism of action understood as a mechanical reaction 'without an agent' and the subjectivism which portrays action as the deliberate pursuit of a conscious intention, the free project of a conscience pursuing its own ends and maximizing its utility through rational computation" (Bourdieu 1980; also Farnell 2012). Therefore, the recognition of a "person" entails the presence of social *habitus* in movement; however, the presence of society-governed actions and *habitus* does not necessitate a unified ideal of personal autonomy. Actor-based embodiment theory solidified itself in anthropology after Drid Williams' (1976) "semasiology", which established a method to understand the different dynamics of human actions. In short, semasiology examines the variable modes of bodily action (speech, sign languages, gestures, and full-body) and how the combine utilization of these movements between individual and communal agents creates interconnected, reflexive relationships according

to contextual time, spatial placement, and cultural environments (Csordas 1990; Farnell 2012; Williams 2019; Walsh 2021).

Embodiment, although, still neglects to discuss the role of emotional expression in relation to action and movement. Despite the contributions of semasiology and embodiment, emotions, while still deemed significant to human agency, are conditioned responses that stem from the different levels of physical and mental embodiment of social experiences (Walsh 2021). Critical realist approaches suggest that emotions play a significant role in the reflexive relationships between social agents. By reflecting emotional responses between individual agents, social structures are maintained and constructed though cyclical, collective action. Emotions are also significant in establishing individual awareness of identity and autonomy, or the "self" (Archer 2000, 2003; Larkins 2019; Walsh 2021). In other words, emotions are one form of individual psychosocial "embodiment" of life course experiences. As embodiment, emotions must then exist on a spectrum of agent-based action, in which the form of emotional action ranges from self-learned or inherent actions to collective, society-governed emotions that are taught through social relationships with other agents (Alderson and Yoshida 2016; Larkins 2019; Walsh 2021).

While the use of embodiment and critical realism has been utilized in sociological and anthropological studies of ontology and agency, the specific application toward otology of personhood has recently made its way into the bioarchaeological examination of past ideals of human autonomy. Specifically, these paradigms have been applied towards understanding the significance of children and young age development in past

populations. By gaining insight to the dynamics of person-based action (physical, mental, and emotional), bioarchaeologists can interpret the reflexive relationships between preadult and adult presented in social identities reconstructed in mortuary contexts (Alderson and Yosida 2016; Larkins 2019). However, these theories have primarily focused on human agents. In-depth discussion of preadult identity and the significance of non-human agents will be discussed later.

Definitions of "Age"

As stated earlier, Western academics define "age" as the approximate time an individual has lived in comparison to the state of physical maturity. Anthropological definitions, however, are further divided into one of three concepts: chronological age, biological age, and social age (Halcrow and Tayles 2008, 2011; Sofaer 2011). Chronological age is the primary form of age recognition, in which temporal measurements such as years, months, or other seasonal cycles are used to record the duration of an individual's life course. Biological or physical age is the measurement of physical maturity or growth during the aging process (Gowland 2021; Sofaer 2011). Together, chronological and biological age have served as the primary standard for biological studies in determining the standards of the human life cycle. The accepted progression of human life cycle incorporates eight different phases: the fetal stage, neonate, infancy, childhood, juvenile, adolescence, adulthood, and senescence (Bogin 1999, 2006). Human life stages are assigned according to the appearance of key biological phenomenon that are highly correlated to universal life course development

and growth that marks specific biological maturation or deterioration. Stage-specific events are distinguished by varied levels of cellular and tissue regeneration, maintenance, or decline to promote differentiation in bodily function or reallocation of energetic resources for increased growth (Bogin 1999; Sofaer 2011). Life stages are further characterized by averaging the chronological ages at which initial appearance of these biological milestones occur. For example, fluctuating growth spurts and the eruption of deciduous teeth in comparison to increased cognitive and mobility coordination are specific indicators of childhood development generally placed between 3 and 7 years (Bogin 1999). The comparison of biological and chronological age, therefore, has been employed as a universal basis of standardizing human growth and development across anthropological and medical institutions to gauge patterns of health and expected life course experiences, such as projected final stature, life expectancy, and risks of later life health impacts (Agarwal and Beauchesne 2011; Sofaer 2011).

The final concept, or social age, is the interpretation of age in which cultural participants are ascribed specific ideals, responsibilities, or behaviors. In other words, social age is a culturally-defined standard in which an individual is incorporated into the communal structure and interactions, particularly in determining ages at which individuals are perceived as fully autonomous and or are considered an independent "adult" (Gowland 2021; Sofaer 2011). While social age draws upon both chronological age and developmental biomarkers, perceptions of age-based behavior and traits do not always conform to Western definitions of human life stages. Cultural ideals of the corporeal body are highly contingent on social identity, as well as the self-conscious and

cultural reconstruction of this identity(s) in living and deceased populations. The aging process thus embodies physical transitions of identity and dictates the form of social interactions and experiences implemented by individual and group agency (Sofaer 2011; Justice and Temple 2019b). The idea of childhood, for example, is a variable concept due to cultural perceptions of age-based dependency and socially defined maturity. In most cases, childhood is defined according to economic or political climates in which participation in communal experiences is reliant on the physical autonomy of an individual, as well as ideals of kinship and familial organization (Justice and Temple 2019b; Kamp 2001; Sofaer 2011).

The application of chronological, biological, and social age is primarily divided among anthropological subfields according to theoretical relevancy; biological age falling into the realm of biological anthropology and archaeology, while social age is attributed to cultural studies of social structure, family dynamics, and symbolic transitions of rites of passage. Chronological age serves as the mediator between biological and social age, in which both concepts are compared to standardized temporal measurements (Kamp 2001; Sofaer 2011). However, culturally defined concepts of age have overlying influence in the treatment and social experience of preadult individuals, which translates to the physical growth, development, and health of these populations, as well as reconstruction of social identity in mortuary practices. Ignoring social age in cultural contexts of anthropological and archaeological studies has biased representations of biological age and distanced the relationship between the physical body and cultural identity (Agarwal and Beauchesne 2011; Justice and Temple 2019a; Sofaer 2011).

Terminology

Defining age and life phases within bioarchaeological and anthropological studies has proven difficult. Firstly, the utilization of terms such as "childhood", "juvenile", and "infant" in biological anthropology does not encompass the same age ranges between cultures, as biological and chronological age are mediated by cultural ideals of ageing that may not conform to the same standards as Western concepts (Sofaer 2011; Halcrow and Tayles 2011). The definitions of infancy, childhood, and adulthood also varies between academic fields due to inconsistencies in age estimation methods or the prioritization of specific biological markers in determining physical age. For example, classification of infancy varies according to subjective physical-chronological age, where medical descriptions only classify individuals younger than 1 year as infants, while anthropological scholars may classify an individual as an infant up to 3 years. Similar issues of subjectivity arise when defining childhood. Here, scholars have argued the extent of human "childhood". Some anthropologists suggest that childhood encompasses a highly specific number of years (i.e., 3 and 7 years) that correlate to slowed early life development, while others have argued that childhood ends with the first indicators of adolescent puberty and appearance of "adult" phenotypic variation (Bogin 1999; Halcrow and Tayles 2011). These viewpoints, however, primarily focus on the correlation between physiological and chronological age without full consideration of the relationship to social age.

Other terminology has been proposed in lieu of life stage classifications by attempting to group together all ideas of young age. At first, "non-adult" and "sub-adult"

were interchangeable in anthropological studies; however, contemporary scholars have critiqued the use of these terms. "Non-adult", for one, signifies that individuals under this category are highly othered or deviant from human adults. "Sub-adult" also others the young by implying that anyone not considered an adult is objectively less, or perceived as inferior to adult individuals (Bornemann 2019; Halcrow and Tayles 2011). Bioarchaeologists today prefer to use the term "preadult", as it simply describes individuals has not yet attained biological maturity. For the purpose of this thesis, "preadult" will be used to describe individuals aged prior to biological maturity.

Bioarchaeology and Mortuary Theory

Initial interest in the ontology of social identity began with the first archaeological analysis of human mortuary practices. Prior to the first contextual studies of mortuary practices, scholars hypothesized that the mortuary practices of paleopopulations related to inconsistent acts of "emotion," in which mortuary landscapes acted as a necessary component to communal function to dispose of human remains following death (Kroeber 1927). However, these early theories also suggested that mortuary practices served key religious and psychological functions through ritualized bereavement that established a symbolic transitional state of being, or rites of passage, in which the living community may maintain a direct connection to the dead. Particularly, social agents undergo a process of physical or social transformation that encompassed a period(s) of liminality, or a subjective state in which individuals are not recognized as part of established social identities or statuses. Individuals are thus seen in a liminal state until rites of passage are completed, in which social communities recognize the active removal from one state of

being and the reincorporation into a new state, role, or identity. Mortuary rites not only parallel rites experienced during the life course, but also constitute specific rites that establish a ritualized system that the dead actively participate in identity negotiation and social contributions with the living community (Carr 1995; Hertz 1907; van Gennep 1909).

Processual and Postprocessual Approaches

Starting in the mid-1960s, anthropologists regained interest in mortuary analysis; however, scholars now recognized the significance and abundance of cultural information provided through mortuary practices and skeletal remains. This approach, or processual archaeology, argues that mortuary practices, when placed in a contextual perspective of a culture's specific history and ecology, are an integral component of social organization in which ideas of communal "personas," or the cumulative identities possessed by a cultural agent or group, are maintained (Binford 1971; Renfrew 1976; Saxe 1971). For processualists, social personas reflected identities associated with social structure or hierarchal organization of socioeconomic or religious roles, such as class systems or systematic group affiliation (Renfrew 1976; Saxe 1971). Organization of social identities also revolved around concepts of "ascribed" and "achieved" identities, in which characteristic personas are gained in multivariate ways according to sociocultural organization. Ascribed identity refers to those given or assigned to individuals following preestablished social norms. Achieved identity, likewise, pertains to the social identities an individual obtains through socioeconomic or behavioral agency, which are typically

attributed to obtained statuses gained before, during, and after and individual's lifetime (Ariès 1977; Saxe 1971; Tainter 1978). For processual theory, the combination of ascribed and achieved identities thus creates an individual's social persona, which is further used to assign social agents to corresponding social class or statuses within a ranked society (Binford 1971; Saxe 1971; Parker Pearson 2000). Age factors into complex identity by establishing biosocial parameters of roles, behaviors, and agency, in which perception of age dictates both ascribed and achieved identities. Cultural mortuary practices, therefore, reconstruct complex social systems by differentiating individuals according to given statuses and ranks. Processualism, therefore, attempts to determine degrees of social complexity or systems of class differentiation by observing patterns of identity-based indicators burial contexts, such as interment form, spatial patterning, and grave goods (Binford 1971; Ekengren 2013; Saxe 1971).

Beginning around 1969-1970, postprocessual archaeology rose to the forefront of mortuary theory through its critiques of processualism beginning with Ucko (1969). While postprocessualism follows its predecessors in emphasizing a contextual approach to mortuary analysis, scholars who adhere to this paradigm also stress how burial contexts are multi-dimensional constructs, in which cultural ideology, ritual, and symbolic interactions are reflected in the treatment of the burial landscape (Carr 1995; Hodder 1982). Therefore, social identities seen within mortuary contexts extend beyond class or social status to include individual life agency and identities that are significant to the overall ideology, symbolic organization, and relationships between cultural agents (Cannon 2008; Parker Pearson 1982; Shanks and Tilley 1982). For example, spatial

patterning and orientation of mortuary landscapes, both individual contexts and the relation between one another, can not only reestablish preexisting identities of communal affiliation or relation, but also allows the living agents to reconstruct or create new symbolic relations and identities that either reflect ideological beliefs of family organization, cosmology, or personal states of being (Cannon 2008; Parker Pearson 1982). While postprocessualism recognizes differences in ascribed and achieved identities, the social identities constructed by complex social personas are not static in terms of class-based ranking. Social identities are also perceived by myriad social agents that extend beyond the immediate social organization, such as cosmological and environmental affiliates. Ascribed and achieved identities, in other words, possess greater sociocultural dimensions than when viewed using processual theory, as identities range in symbolic representations beyond strict status or class indicators (Fewster 2006; Fowler 2013; Knudson and Stojanowski 2008; Moss 2005).

Archaeologists and bioarchaeologists have continued to argue whether processualism or postprocessualism are capable of perceiving mortuary practices in their entirety (Brown 1995; Fowler 2013; Shimada et al. 2004). While both paradigms have fundamentally changed bioarchaeological study of mortuary practices, the strict use of one paradigm neglects to incorporate the multidimensional variables of human social identity, including the intersectionality between the ontology of personhood and how these identities are embodied, reconstructed, and altered as cultural participants transition and interact with multivariate environments (Carr 1995; Ingold 1998; Moss 2005; Sofaer 2011; Zuckerman and Armelagos 2011). Contemporary bioarchaeologists have therefore

called for a "merging" of paradigms, as well as better incorporation of cultural biosocial dimensions of age and how these ideas translate into interpreting human biological variation (Agarwal and Glencross 2011; Sofaer 2011).

Social Theory in Bioarchaeology

Current bioarchaeology is actively revisiting past examinations of social identity to better understand sociocultural ontology and to move away from the dichotomy of processual and postprocessual approaches. With greater collaboration of interdisciplinary methods initiated by Washburn's (1951) "New Physical Anthropology," including isotopic analysis and microstructural analysis of skeletal and dental histology, investigation of human skeletal remains allows in-depth examination of life experiences across the developmental timeline of the human body (Agarwal and Beauchesne 2011; Dirks et al. 2002; Fuentes 2010; Sandberg et al. 2014; Temple 2019). The development of bioarchaeological approaches towards human life history, such as the Developmental Origins of Health and Disease (DOHaD) hypothesis, have also called for the need of bioarchaeologists to reassess the correlations between human biological variation and human adaptive plasticity through which environmental conditions (natural, socioeconomic, and cultural) are embodied during early life development and result in long-term impacts on both individual and populational health and mortality in later life stages (Agarwal 2016; Gluckman et al. 2007; Temple 2019a).

To properly assess the development of physiological variation and identity, bioarchaeologists have begun to revisit skeletal analysis of priorly "neglected" populations. Social or biocultural theory has emphasized a need for anthropology to

reconsider such populations in mortuary contexts; initial theories introduced in conjunction with feminist anthropology in the 1970s calling for the reevaluation of sex and gender in past populations. These feminist approaches primarily called for contextual evaluations of gender expression, in which representation of personal identity in mortuary contexts are not solely interpreted through skeletal indicators of biological sex. Contextualizing gender identity disregards binary alignment implied by Western colonial standards of sex and gender estimation in early anthropological work, where biologically-estimated males were exemplified as primary contributors to socioeconomic activity and authority in social organization (Agarwal 2016; Barnett 2015; Chang 2020; Geller 2008; Hollimon 2011). Biocultural approaches, as a result, have begun to acknowledge the significance of female identifying individuals in past populations by examining the intersectionality between mortuary social narratives and skeletal analysis. For example, comparisons of sexual dimorphism in skeletal samples have demonstrated ranging degrees of robusticity and cortical remodeling in limb cross-sections between skeletally-identified males and females, which suggests that individuals of varying sex identities participated in a wide range of labor. Macintosh et al. (2017), for example, demonstrated that skeletally-identified females from multiple prehistoric timeframes (~5300 cal. BC to 100 AD) displayed limb rigidity that surpassed measurements in modern day athletes. In comparison to ethnohistorical accounts, skeletal evidence such as that in Macintosh et al. (2017) suggested that female individuals participated in highly intensive modes of labor and activity, which not only exceeded prior ideas of male-intensive socioeconomic activity across socioeconomic lifestyles, but also disproves

concepts of heteronormative male-female divisions of labor (Barnett 2015; Macintosh et al. 2017; Temple et al. 2021, 2022; Zuckerman and Crandall 2019). Recently, greater inclusion of Indigenous and queer theory critiques feminist approaches in that these theories still operate along the dichotomy of gender norms imposed by Western definitions of "masculine" and "feminine" gender expression, which has caused mass erasure of non-binary identities in the archaeological record (Barnett 2015; Chang 2020; Geller 2008; Jackes 2011; Temple et al. 2021, 2022). In this way, critical social theory has taken steps to disestablishing concepts of "normal" sex and gender representation in mortuary contexts by simultaneously disestablishing ideals of "abnormal" or non-conforming gender identity implemented by colonial views in anthropological inquiry and exemplifying embodiment of lived experiences through skeletal morphological variation (Chang 2020; Sofaer 2006; Temple et al. 2021, 2022; Zuckerman and Crandall 2019).

The rise in feminist approaches in bioarchaeology, however, reoriented bioarchaeological mortuary analysis to also reevaluate perceptions of young age and preadult representation in past populations by challenging preconceptions of kinship. Prior to the 1970s, the recovery and study of preadult remains primarily focused on paleodemographic recording of past populations, including fertility, mortality rates, and population statistics. Anthropological studies of kinship systems followed genealogical frameworks of family organization introduced over the discipline's early decades, in which concepts of relatedness were founded on ideals of generational biological inheritance. These studies inherently followed social traditions emphasized through

Euro-Christian ideals of the 19th and early 20th centuries that coincided with the rise in kinship studies, where emphasizing genealogical kinship indicated that biological relatedness was a "natural" form of organizing human relationships (Johnson and Paul 2016; Wakefield-Murphy 2017). Further implication of genealogical kinship enforced Christian-Western norms of sex and gender, such as those concerning familial authoritative structure and division of labor. Here, preadults fall under the domain of biological females in terms of domestic relationships. Preadults were conceptualized as factors in domestic relations, or as dependent non-agents who relied on independent individuals for physiological and social training (Hollimon 2011; Halcrow and Tayles 2011; Wakefield and Murphy 2017; Wilkie 2000).

However, anthropological methods of the time emphasized adult physiology, primarily the recovery of adult crania in order to study evolutionary and biological variation in past populations. These variations translated into typological systems of classification, where regional or cultural groups were placed into racial categories characterized by similar patterns of physiological traits, including perceived susceptibility to specific disease and population health (Bornemann 2019; Hoppa 2002; Lewis 2007; Washburn 1963; Zuckerman and Armelagos 2011). Preadult remains were thus excluded from skeletal collections due to undeveloped skeletal phenotypes. Diffuse belief of skeletal preservation and excavation methods allowed for further exclusion of preadult remains. Due to increased fragility and undeveloped skeletal material, archaeologists assumed preadults had low chances of preservation within burial contexts, in which high rates of fragmentation or total skeletal decomposition was consistent within institutions.

Improper identification methods also led to misidentification of impartial remains as faunal remains (Baxter 2008; Bornemann 2019; Kamp 2001; Lewis 2007). Other forms of institutional bias towards preadults included age estimation methods, in which inconsistent standards and subjective chronological boundaries of specific ages resulted in the skewed demographic representation; the majority of cases resulting in population ages skewed towards late adolescence (approximately 17-20 years) and young adults (approximately 21-35 years), as both preadults and senescent individuals were excluded from anthropological foci (Gowland 2021; Hoppa 2002; Klepinger 2006).

Reevaluation of biological anthropology, however, initiated paradigm shifts away from typological classification systems. Particularly, new generations of anthropologists questioned established theories of human physiological evolution, such as the racial, typological classification of human phenotypic variation. Instead, the study of human variation should focus on the processes of phenotypic evolution, in which multivariate factors caused by individual life experiences, population dynamics, and environmental variation. This shift is typically attributed to Sherwood Washburn's "New Physical Anthropology," which consisted of "synthesizing" a multi-focus approach to human evolution utilizing cross-discipline methods to examine the evolutionary development of physiological variation, such as osteological development (Fuentes 2010; Washburn 1951, 1962). Washburn's critiques, while not directly addressing biases towards preadult remains, introduced the initial principles that would later translate to the development of the life history approach to human variation. Previous growth and development studies, such as those conducted by Franz Boas (1912) and W. Montague Cobb (1935;1938), also

contributed to later establishment of life history and life course theory by emphasizing the significance of both early life physical and social environments on the trajectory of growth and adult morphology. Specifically, scholars such as Cobb and Boas suggested that social factors, such as socioeconomic status, familial histories, and other sociocultural relationships between cultural agents directly correlate to access to key developmental factors, including nutritional and healthcare availability. Variation in both individual and communal experiences, therefore, creates varied ecological exposure and resource availability, which further influences physiological buffering between essential functions and maintenance during early life development (Boas 1912, 1930; Gowland 2015; Watkins 2007, 2020; Worthman and Kuzara).

Biological life history and life course theories, however, propelled anthropologists to further consider the consequences of sociocultural environments on physiological development. The added application of social theory to a life history approach thus allowed bioarchaeologists to examine the multivariate ways in which biological variation correlates to social characteristics prescribed to individuals over the life course. Feminist scholars theorize that cultural engendering processes beginning in early life contributes to initial phenotypic and behavioral variation between social agents. While sexual dimorphism has some biological stance, social interactions based on sex and gender recognition has direct correlation to the sociocultural identities and behaviors of individuals starting either in the prenatal or perinatal environment (Agarwal 2012; Shields 2008; Geller 2008). This includes cultural gender identities concerning adult individuals, as the biosocial experiences, roles, and relationships between different agents

relates to those norms placed upon preadults. Intersectionality theory details that the production of gender identity through the social and physical expressions of individual gender and sex correlates to life history of health and disease. Developed to address biases in female-identifying minority populations, intersectionality specifies how individual embodiment of lived experiences, particularly variation in physiological indicators of health and disease, can be attributed to the embodiment of biological sex and gender in relation to the multivariate biosocial relations established between ecological, human, and social agents, including socially-specific access to resources and behavioral expectations (Agarwal 2012; Hooks 1984; Shields 2008; Zuckerman and Crandall 2019).

As a result, bioarchaeological studies have begun to incorporate intersectionality approaches to addressing osteological variation in pathological and developmental indicators in skeletal populations. These approaches have aided in dispelling biases in the archaeological record, in which prior studies established the notion of specific pathological lesions, such as cortical wasting and cribia orbitalia, were more prevalent in biological females due to consistent participation in gender- specific labor in comparison to increased physiological tolls of childbearing instead of gender-based variation in health and disease (Agarwal 2012; Hollimon 2012; Wilkie and Hayes 2006; Zuckerman and Crandall 2019). Further incorporation of queer theory, third-wave feminism, and greater inclusion of Indigenous scholars have added to the life history-intersectionality approach by highlighting the significance of non-binary gender identities in bioarchaeological studies of past populations, which have further dispelled

heteronormative concepts of labor, health, and pathology (Knudson and Stojanowksi 2008; Hollimon 2012; Wakefield-Murphy 2017; Zuckerman and Crandall 2019).

Hunter-Gatherers and Ontology

Hunter-gatherer societies have played an integral part in anthropological studies since the discipline's early origins. For the first half of the anthropology's history, however, scholars mainly orientated studies towards understanding both tracing human physical and cultural evolutionary pathways. Here, academic perspectives of hunter-gathers contributed to typological ranking of human sociocultural systems, in which both physiological and cultural traits, including economic systems, religious beliefs, and social organization, were juxtaposed to establish a classification system of "complexity" that constituted assumptions of "primitive" and "civilized" lifestyles (Rodan 2020; Temple and Stojanowski 2019). Scholars such as Lewis Morgan (1877) proposed that human socioecological systems existed along a unilinear spectrum, in which earliest forms of human socioecological organization (hunter-gatherers in this sense) constituted the simplest forms of cultural organization and belief systems that progressed into more complex forms.

Publication of Charles Darwin's (1890) work fueled further theories of linear human physiological and cultural evolution, where scholars argued that environmental constraints and socioecological activity determined the trajectory of sociocultural progression (Marks 2012; Rodan 2020; Temple and Stojanowksi 2019). The "predestined" goal of such progression would ultimately end in a society adopting biosocial traits ascribed to Western-European societies (Darwin 1890; Frazer 1890;

Marks 2012). As a result of these paradigms, anthropological studies of contemporary hunter-gatherer societies adhered to cultural evolutionist principles, stating that living populations exhibited states of "arrested" social development, where socioecological constraints inhibited the progression between cultural transitional phases towards the result of civilization. Contemporary hunter-gatherers were consequently referred to as cultural "snapshots" of the human evolutionary past, or "living fossils", for comparable subjects for academic institutions (Blurton Jones 2006; Darwin 1890; Rodan 2020; Sahlins 1972; Temple and Stojanowksi 2019). Mortuary investigation of hunter-gatherers, therefore, primarily focused on the procurement of human remain subjects for anthropological institutions to conduct physiological comparisons of regional populations in order to determine biological indicators of behavioral and social characteristics. For early biological anthropology, this consisted of primarily osteological measurements and craniometric comparison between various skeletal populations; most of the collections used comprised of Indigenous and non-Western populations excavated using inconsistent and oftentimes unethical methods between institutions or scholars (Buikstra 2006; Hrdlička 1918; Spencer 1981).

By the mid-1900s, cultural ecologists began to critique previous studies by implementing ethnohistoric and early life history perspectives, which called for reanalysis of hunter-gatherer populations in context of socioecological and environmental relationships with biological development. Specifically, new studies of hunter-gatherer societies emphasized the biobehavioral relationships between both human and environmental agents that are the result of integral interactions between hunter-gatherers

and the environment. For example, scholars emphasized the complex socioecological meanings behind specific actions that not only serve as means of subsistence or economic strategies, but also are significant in maintaining key relationships with other social agents, or non-human agents (Bird-David 2018; Hawkes et al. 1989; Ingold 2002; Laughlin 1968; Parsarić and Warren 2019). Hunting, for one, constitutes multiple physical and symbolic interactions with non-human animal agents, in which hunter-gatherer societies recognize the autonomy of animals. Each phase of the process, including as the tracking, butchering, and disposal of animal remains, was performed following established ideals of human-environmental reciprocal relationships to maintain the socioecological connections between human, animal, and other environmental agents (Hill 2011; Ingold 2002; Laughlin 1968; Lokensgard 2018; Sahlins 2018). These human-environment relations, therefore, are integral to both the social structure and ideological organization of hunter-gatherer societies, as all individuals involved in socioecological behaviors are inherently tied to the greater human-environment network (Hill 2011; Ingold 2002; Lokensgard 2018; Parsarić and Warren 2019; Schulting 2019).

Processual and postprocessual approaches have offered several frameworks to rearticulate the social dimensions of hunter-gatherer mortuary practices. These approaches, while incorporating the same contextual evidence presented in burial landscapes, emphasize the variation between sociocultural and symbolic burial forms. As discussed before, processualist views of mortuary practices focused on patterned variances in burial forms in association with social stratification, such as class-based ranking or status attainment. By prioritizing consistent presence-absence of burial form,

grave goods, and spatial patterning of individuals, hunter-gatherer mortuary practices demonstrate establishment of social inequality following organization of social statuses, such as egalitarian systems of organization or role-based hierarchy (Mizoguchi 1993; Saxe 1971; Schulting et a. 2020). For example, Tainter (1978) proposed an "energetic expenditure" methodology of mortuary analysis. Here, variation in mortuary forms were indicators of differing group investment of time and energy into the burial of specific individuals, in which the "complexity" of burial form and grave good presence demonstrates correlate with specific social statuses (Schulting et al. 2020; Tainter 1978). Cross-site analysis and long-term mortuary comparisons thus further distinguish rates of human behavioral development, in which gradual adoption of sedentary socioecological practices is inferred as increasing rates of socioeconomic stratification within transformative societies (Carr 1995; Price 1995; Saxe 1971). While acknowledging status differentiations within burial contexts, postprocessualists critique that processual approaches limited the degree of sociocultural dimensions and symbolic relationships represented in persistent hunter-gatherer societies. Here, observed "inequalities" in burial contexts may indicate modes of human agency and individualized social relationships reconstructed in the mortuary landscape. Plasticity in hunter-gatherer practices, therefore, may suggest changes in individual or group dynamics that correlate to sociocultural or ecological agency (Buikstra 2019; Knudson et al. 2020; Schulting et al. 2020).

The dichotomy between processual and postprocessual paradigms, while both offering contextual arguments to the social ideologies of hunter-gatherers, place the

significance of mortuary identities in a binary between socioecological and sociocultural importance. The presentation of ascribed or achieved identities, as such, is seen as the cumulation of roles, behaviors, and relationships that are significant to hunter-gatherer societies. Therefore, expressed inequalities presented in mortuary contexts are the result of individual identities obtained during the life course (Hodder 1982; Ingold 2002, 2005; Stojanowski and Knudson 2020). In many cases, hunter-gatherer societies were compared to sedentary, agricultural societies where differences in socioecological behaviors translate to social organization (Bender 1985; Blakey 1971; Larsen 2000; Thomas 2011). Thus, hunter-gatherer societies were defined by subsistence procurement, in which relationships with said subsistence materials correlated with systems of achieved and attained identities. However, biocultural approaches to hunter-gatherer mortuary practices, with greater emphasis on social theory and embodiment, demonstrated that the social dimensions presented in biocultural identities of hunter-gatherers consist of complex ontological relationships that are interdependent on socioecological behaviors. Observable inequalities in mortuary practices, therefore, are attributed to multidimensional identities, whether ascribed or achieved, that are intrinsic to the ontological identity of hunter-gatherer societies. One factor in explaining differences in mortuary identities consists of identifying both lateral and horizontal degrees of social stratification, or systems of distinguishing individuals that may not necessarily result in "ranked" or class-based organization (Schulting et al. 2020; Stojanowski and Knudson 2020; Zuckerman and Armelagos 2011). These factors consist of various experiences, roles, and behaviors that effect both individual and group

interactions within the social organization. These differences consist of interrelated physical and social traits, such as differences in individual diets, habitual activity, and social expectations of different social agents (Ingold 2002; Kiriyama and Kusaka 2017; Temple et al. 2021; Tsutaya et al. 2013). Variation in biosocial ascribed and achieved identities thus relay individual trajectories of ontological development, in which hunter-gatherer societies construct and interact in many ways with other social agents. Social contributors of course include human agents, non-human agents, and other ecological or cosmological agents.

Persistent relations with animal and ecological agents are thus incorporated into attained biosocial identities of hunter-gatherer societies. Biologically, non-human agents are represented in the osteological and morphological development of human remains. Consistent consumption of specific faunal and flora species would be reflected in isotopic absorption into enamel dentine during early life development of deciduous and permanent teeth, as well as trace isotopic elements in bone matrices in correlation to bone growth trajectories and the presence of diet-specific pathologies (Schillaci et al. 2011; Stojanowski 2019; Temple et al. 2014; Tsutaya et al. 2013). Differences in these biomarkers can thus be compared to social factors presented in human remains, particularly in the treatment of human remains during cultural burial rites. Inclusion of animal remains or animal-made materials has provided insight to symbolic relationships presented in mortuary contexts, such as indicators of human agents' roles in key ontological relationships created through subsistence, religious, or social practices. These grave goods, or implements, distinguish human agents not only in terms of

ascribed identities between human and non-human agents, but also utilized in the construction of human mortuary relationships between living and deceased agents (Jonuks and Rannamäe 2018; Ingold 2002; Morrow and Volkman 1975; Parsarić and Warren 2019; Sahlins 2018; Whitehead 2018). Continuous interment and manipulation of the dead within cultural mortuary landscapes thus provides means for living individuals to maintain or negotiate sociocultural associations, such as interactions with spirit or ancestral communities. These associations are presented in the spatial arrangement of interments, in which proximity, orientation, and articulation of remains dictates cosmological or social standing (Cannon 2008; Justice 2017; Rodan 2020). Therefore, hunter-gatherer mortuary practices demonstrate the ontological relationships between human and non-human agents enacted through persistent inherent agency of human, environmental, and cosmological entities (Crandall and Martin 2014; Ingold 2002; Sahlins 2018; Stutz et al. 2013).

Reexamination of past hunter-gatherers with contextual understanding of biosocial ontology is significant to further build bioarchaeological perspectives of cultural resilience theory. Resilience theory, in the context of hunter-gatherer societies, articulates the cyclical processes in which societies adapt to shifting socioecological environments. These processes include adaptive strategies in which availability, use, and reliance on ecological resources influences socioecological to maintain cultural presence (Schulting 2019; Temple 2019a; Temple and Stojanowski 2019). Here, the embodiment of biosocial relationships may reveal patterns of collective social action during times of ecological or social change to maintain key ontological identities. Observations of

hunter-gatherer resilience are essential to understanding how cultural groups, both past and present, mitigate the effects of both ecological and physiological stress events, including the long-term effects of cross-cultural interactions and colonialism (Jonuks and Rannamäe 2018; Schulting 2018; Temple and Stojanowski 2019).

Conclusions

The ontological turn in anthropology introduced a new wave of inquiry into how human life experiences are embodied in human skeletal remains. Progression of bioarchaeological methods and multidisciplinary theories has demonstrated the intersectionality of human physiological development and sociocultural behaviors, in which biological traits presented in skeletal and dental analysis are the result of complex social, environmental, and biological relationships established between autonomous entities. Further inclusion of current paradigms, such as social, feminist, and Indigenous theory have also emphasized prevalent biases in past investigations of past populations, including preadult individuals, in which typological classification systems negated complex social identities presented in cultural mortuary practices and human osteological variation (Buikstra 2006; Jackes 2011; Knudson and Stojanowski 2008; Larsen 2018).

In the case of hunter-gatherer populations, recognition of complex relationships between human and non-human agents has opened new perspectives for bioarchaeologists to examine how overlapping identities and relationships with the environment are ingrained in human remains (Harris and Crellin 2018; Whitehead 2018). At first, hunter-gather societies were priorly defined and compared by socioecological behaviors, in which evidence of inequalities in the taphonomy and treatment of human

remains in burial contexts indicated established systems of social division that were tied to socioecological procurement systems. However, incorporation of biosocial methods considering processual and postprocessual approaches has demonstrated greater intersectionality between hunter-gatherer identities, subsistence practices, and ontological ideals (Goldstein 2006; Justice and Temple 2019a; Ingold 2002; Knudson et al. 2020). The relationships between social agents in these societies are inherently plastic, in which societal life histories are exposed to myriad experiences that unfold over individuals' life course and following corporeal death. As a result, ontological relationships between human and non-human agents were constantly negotiated through biosocial relationships between participants, including those interred in persistent mortuary landscapes. These "eternal ontologies," embodied in hunter-gather human remains, thus demonstrate how these societies possess multidimensional identities that cannot be categorized based on concepts of inequality, rank, or complexity (Ingold 2005; Schulting et al. 2020; Temple 2019a; Temple and Stojanowski 2019). Eternal ontological relationships further embody resilient sociocultural behaviors, in which key cultural identities are maintained through periods of socioecological change (Temple and Stojanowski 2019).

CHAPTER TWO: BIOARCHAEOLOGICAL INVESTIGATION OF PREADULTS

The study of preadult skeletal remains has provided bioarchaeologists with significant insight to the embodiment of human physiological variation throughout the early lifespan. However, in the context of mortuary treatment, preadults demonstrate the intersectionality between cultural perceptions towards childhood and how these principles influence the rate and method of physiological embodiment of socioecological relationships (Agarwal and Beauchesne 2011; Thompson et al. 2014). The fetal, infancy, juvenile, and adolescence life stages are a critical point in the individual lifetime, in which individuals not only undergo essential physical, cognitive, and social development at rapid rates, but are also highly susceptible to variable biological mitigation from environmental shifts due to developing immunological and physiological systems (Bogin 1999; Cardoso 2007; Temple 2019a). This susceptibility is recognized across most human societies and is integrated into ideals of childhood experience and social expectations of life course events, including early mortality. Therefore, preadult remains provide exemplary forms of the human body representing cultural beliefs in personhood and ontology.

Age Estimation Methods in Bioarchaeology

Skeletal Age and Morphology

Skeletal growth and development have been utilized as the primary indicator of biological age throughout the academic history of human physiological variation. Most skeletal identification methods include examining key epicenters of osteological formation and growth, such as the fusion of cranial sutures, epiphyseal growth centers of longs bones, and development of the auricular surface and pubic symphysis (Calce 2012; Kemkes-Grottenthaler 2002; Klepinger 2006). While timing of ossification and fusion are correlative to biological indicators of maturation, individualized rates of growth are susceptible to socioeconomic and environmental buffering, or variable instances of stress events can impact overall trajectories and timing of observed skeletal growth. External distress would include interruption to energetic expenditures towards physical growth via nutritional uptake or reallocation of energy stores to maintain immunological function during times of pathological exposure. Age-at-death estimations from interpopulation samples also raises questions of heterogenous survivability of stress events, or determining instances of cross-individual differences in physiological buffering systems and age experiences (Holman et al. 2002; Knudson and Stojanowski 2008; Temple and Goodman 2014; Wolfe and Herrmann 2022). Juxtaposition of skeletal growth differences and morphological variation, however, can provide insight to age-specific life course experiences in response to physiological stress evens during early life development.

Stress events indicated in osteological growth in preadult remains are multivariate in causation; allowing bioarchaeologists to propose how sociocultural interactions and perceptions of age facilitate energetic regulation of growth and health. For example, stunting of long bone growth and epiphyseal ossification may be result of differences in nutritional availability during early life stages. Instability in maintaining essential energetic uptake via supplemental foods during early prenatal and childhood stages may yield periods of interrupted growth, or stunting of long bone development. Similarly, exposure to infectious disease or pathology during early life phases may have necessitated reallocation of metabolic and available nutritional energy to immunological function to prevent further illness at the cost of growth (Bridges et al. 2000; Cardoso 2007; Johnston 1969; Schillaci et al. 2011; Temple and Goodman 2014).

However, comparison of populational preadult growth trajectories may show individual growth patterns. In some cases, “catch-up growth" can be seen in individuals that demonstrated prior growth interruption through long-term studies of growth trajectories. This later rapid growth may be the result of environmental advances in nutritional availability, such as introduction of higher concentrated supplementary foods, that promote skeletal growth that was priorly slowed due to unmet energetic requirements. Renewed growth and development may also lead to remodeling of skeletal lesions caused by prior pathological infection or weakening of osteological structure (Bogin 1999; Klaus 2014; Temple 2008; Schillaci et al. 2011). Skeletal morphology and growth patterns can be attributed to multivariate environmental stimuli, such as nonspecific pathological exposure. However, comparison of growth trajectories and

skeletal lesions to archaeological and ethnographic profiles of past populations may provide insight to correlated biological-social factors. Such factors include social expectations of preadult behavior, including socioeconomic duties of "working" age preadults. Cross-sectional analysis and remodeling of skeletal tissue in long bones can also show patterns of continuous activity or exertion on the skeletal structure that can indicate specific motions, mobility, and workloads. Distribution of workload and stress remodeling in preadult skeletons can thus gauge physical involvement in social networks, such as acting in subsistence modes or other forms of labor (Bridges et al. 2000; Kamp 2001; Larsen 1999; Larsen and Walker 2010).

Dental Formation and Eruption

Bioarchaeological analysis of dental development and morphology have proven to be a more accurate form of age estimation. While still susceptible to extrinsic factors, enamel formation repeatedly yields less variability when exposed to myriad environmental factors unlike skeletal tissue. Most characteristics of dental morphology, such as tooth size, have an 80-90% correlation to genetic inheritability (Halcrow et al. 2007; Klepinger 2006; Larsen 1999). Contemporary age estimation methods readily utilize multiple-trait analysis that incorporate both dental formation and several skeletal indicators for more accurate estimation of biological age while accounting for external influence (Holman et al. 2002; Klepinger 2006). Dental development has been shown to have a high correlation with other age-specific biomarkers that aids in determining both biological age and developmental rates. The first permanent molar, for one, is

emphasized by biological anthropologists due to precise correlation between alveolar development, cessation of postnatal brain development, physiological growth (Bogin 1999; Halcrow et al. 2007; Smith 2013). However, deciduous and permanent dentition are also susceptible to variability in morphology and developmental timelines due to sociocultural environments during early life phases, such as culturally-contingent breastfeeding practices and dietary variation between social agents (Bogin 1999; Dirks et al. 2002; Sellen 2006; Temple 2019a).

Use of dental indicators of biological maturation, while it provides a more accurate method than single or multiple-trait analysis of skeletal indicators, has been critiqued by recent studies due to homogenous recoding of crown-root formation and eruption in comparison to chronological age estimations (Halcrow et al. 2007; Liversidge et al. 2010; Smith 1991). In other words, dental formation cannot be placed in a secular pattern, as sociocultural factors and heritability of dental traits cross populations may have differential impacts on trajectory of growth for deciduous and permanent dentition. Likewise, the use of contemporary, Western-based standards of tooth development that are aligned with chronological ages set by myriad longitudinal studies place all observations of dental development in a uniform trend, which may negate contextualized variations in preadult growth (Halcrow et al. 2007; Liversidge and Molleson 2004; Smith 1991). Other bioarchaeologists have also pointed out biases in the subjective method of age estimation such as the emphasis on the phase of structural formation, emergence from the alveolar surface, or first appearance of specific teeth (AlQahtani et al. 2010, 2014; Liversidge and Molleson 2004). Many of said studies also recorded age estimations

against biological sex estimations. Here, biases can occur using sex-specific estimations for very young preadult remains, such as fetal or neonatal individuals, as sexual-dimorphic skeletal traits have yet to develop. Similarly, cultural ideals of sex and gender may further influence preadult experiences, including sociocultural environments of the mothers (DeWitte 2018; Halcrow et al. 2007; Zuckerman and Crandall 2019).

Several forms of estimation have been proposed to counter prior methods, such as averaging ages of attainment (the first appearance of a tooth at a given developmental phase), recording the mean age of all individuals observed at a given phase, and average age of formation (the completion of a specific developmental phase) (Smith 1991). However, these methods still adhere to chronologies established by prior longitudinal studies. As a result, bioarchaeologists have designed scales of maturity to counter the bias of chronological-based estimation methods. Maturity scales are primarily used for populations with known ages, so that progression of dental development is juxtaposed to recorded chronological age to assess dental-chronological age relationships. The most recognized maturity scale utilizes established age estimations derived from several methods (i.e., mean age of attainment and formation combined) in comparison to deciduous and permanent crown-root-apex formation and resorption depicted in Moorrees et al. (1963). Moorrees et al. (1963) is recognized in biological anthropology as the most accurate representation of dental formation phases, particularly for mandibular tooth identification, and is applied in almost all phase-based estimation methods that do not need prior knowledge of age or sex (Halcrow et al. 2007; Klepinger 2006; Smith 1991).

Biocultural Approaches to Preadults

Biosocial Mortuary Practices

Variation in skeletal and dental morphology permits bioarchaeologists to understand how human life history strategies influence the trajectory of health and development over individual life courses. To understand osteological variation in past populations, bioarchaeologists compare physiological, genetic, and ethnographic information to reconstruct the complex biocultural experiences across human societies. However, the specific treatment of human remains in cultural mortuary practices can provide further insight into the social interactions embodied through skeletal physiology (Buikstra 1977; Larsen 2000; Robbins 2011). The mortuary treatment of preadults, for one, can detail cultural ideals and social placement of young individuals. Initial investigations of preadult populations in mortuary landscapes were used primarily in paleodemographic studies to assess fertility and mortality rates of past populations. However, with recent emphasis of life history approaches and inclusion of biosocial theory, biosocial analyses of preadult mortuary practices have increased as bioarchaeologists recognize the significant evidence presented in preadult contexts concerning biosocial experiences of living individuals, including the intersectionality of biological and social maturity (Clark et al. 2020; Halcrow and Tayles 2008; Kamp 2001).

Cultural definitions of childhood vary across societies according to ideals of maturation, social organization, and individual autonomy. In many cases, preadults display distinguishing variations in burial treatment that differentiate these individuals from other social agents. For example, spatial arrangement of preadult skeletal remains

within single burial contexts and broader mortuary landscapes may indicate cultural beliefs of preadult dependency. Separation from common cemeteries or interment in designated "children cemeteries" is one form of indicating preadult liminality or differentiation from the adult community (Fox 1996; Klaus 2018). Jar or container burials, such as those observed in Jomon culture of ancient Japan, may serve as another form of separation form matured individuals, or even as a form of protection in recognition of the fragility of young individuals (Andrews and Bello 2006; Halcrow and Tayles 2008; Lewis 2007; Temple 2018a). Conversely, specific placement of preadults may signify continual dependency and persistent identity. Preadult burials in domestic settings, such as beneath households or residential structures, have been hypothesized to reflect beliefs of extended reliance on family or communal support following preadult mortality; the skeletal remains of preadults who died during liminal social ages are therefore kept close to living relatives and caregivers (Klaus 2018; Manzanilla 2002; Storey 1983). Similar hypothesizes have been made when observing multiple interments, where preadults interred with one or more matured individuals recreates independent-dependent relationships. Spatial patterning and other traits of preadult burials, when compared to biological age estimations, osteological growth, and other taphonomic traits of health, thus indicate both biosocial age identity that is recreated in human remains (Clark et al. 2020; Inglis and Halcrow 2018; Schillaci et al 2011). For example, nutritional deficiency, in some cases, can be attributed to perceptions of infancy-childhood transitions, in which culturally-determined practices of breastfeeding can affect rate of nutritional uptake. During weaning, preadults can experience a gradual remove

from main nutrition provided by breast milk, where nutritional deprivation impacts skeletal growth until fully transitioned to solid foods. While complementary foods are introduced during this critical period, food type and breadth can determine if biological energetic costs are met to maintain rapid growth and stress responses. In some cases, post-weaning diets may consist of lower quality foods that do not provide equivalent nutrition as breast milk, which may result in further impacts on preadult growth and health (Katzenberg et al. 1996; Martin et al. 2014; Temple et al. 2014).

Embodiment of biosocial identity is not only seen in the morphology and treatment of human remains. Inclusion of material culture, or grave goods, within burial contexts serve as multipurpose social symbols and offerings of bereavement. The presence, type, and number of grave goods in contextual mortuary landscapes can signify multiple aspects of the individual(s) interred with, including social status, socioeconomic involvement, and symbols of social or cosmological associations (Bornemann 2019; Classen 2019; Rothschild 1979 Sofaer Deverenski 2000a, b). These assumptions apply to both mature individuals and preadults. In the archaeological record, anthropologists emphasize the representation of childhood in material culture, particularly the significance of child-made or associated implements. Identified "toy" artifacts are significant indicators of preadult experiences, as they exemplify both biosocial development and interactions with other cultural agents. Through creation and play interactions, toys represent the different forms of play interaction that aid in childhood motor and cognitive development. Likewise, toys and other "play" objects pertain to social behaviors and expectations placed on preadults at specific life phases, including

gender norms (Dorland and Ionico 20221; Janik 2000; Joyce 2000; Sofaer Deverenski 2000b; Wilkie 2000). Preadult social development is also embodied in the presence of self-made utilitarian implements, ornaments, or symbolic objects, where important socioeconomic skills are passed down from older societal members to younger generations (Dorland and Ionico 2021; Greenfield 2000; Hawcroft and Dennell 200; Joyce 2000). Again, teaching of significant skills and roles reinforced established social norms and expectations of social agents, as well as signify important relationships between social agents. Integration of specific status or role-based grave goods into preadult burial contexts thus allows living agents to reconstruct achieved status and associated identity symbols according to an individual's age-at-death that correlates with perceptions of autonomy by living societal agents.

Preadults and Hunter-Gatherer Ontology

As such with past societies, bioarchaeology of preadults is essential to understanding the ontology of hunter-gatherers. Specifically, representation of preadults in mortuary practices have permitted greater insight to the biosocial organization and beliefs of young individuals. Assessment of human remains across multiple stages of biological maturation has shown how bioarchaeological investigation of mortuary practices intersects not only with the embodiment of hunter-gather socioecological experiences, but also how those experiences constitute ideals of autonomy and hunter-gatherer identity over the life course that plays into the grand scale of sociocultural organization for each society. Integration of preadults into hunter-gatherer social

dimensions, as such, follows ideals of persistent relationships between all autonomous agents incorporated in social identities, including non-human and cosmological agents (Bornemann 2019; Fowler 2004; Justice and Temple 2019a; Kamp 2001).

As stated before, preadults have been recognized across human history as highly susceptible to socioenvironmental conditions, as early life development is characterized by high rates of physical and social plasticity (Bogin 1999; Temple 2014, 2019a). Early life plasticity is portrayed in social ideals of preadulthood identity and autonomy, in which expectations of individual dependency, behaviors, and even survivability are ascribed over the course of biosocial development. Similarly, preadults transition through a range of identities that are achieved by reaching specific points in their biosocial lifetime, which further correspond to new ascribed behaviors and roles (Fowler 2004; Janik 2000; Schillaci et al. 2011). These identities are perceived in the relationships established during a preadult's lifetime, such as the degree of care, community interaction, and involvement in social-cosmological interactions, as well as continuation or alteration of such relationships following a preadult's death (Janik 2000; Justice and Temple 2019b; Klaus 2018; Larkins 2019; Schillaci et al. 2011). As a result, societal-recognized immature individuals, or those who do not identify congruently with matured social agents, perpetuate achieved and ascribed identities in cultural mortuary practices through replication of social ontology.

Bioarchaeological investigations of hunter-gatherer mortuary practices thus reveal ideals of human ontology through the treatment of preadults in social mortuary landscapes. Variation in cultural definitions of age, as well as contextual distinctions

between biological and social maturation, is represented in multidimensional forms of burial construction, in which cultural concepts of social organization intersects age with sex and gender, religious and belief systems, sociocultural norms, and socioecological systems (Justice and Temple 2019b; Halcrow and Tayles 2008; Inglis and Halcrow 2018). For example, Justice and Temple (2019a, b) examined how the burials of preadults reflect ontological ideals of biosocial identity in the mortuary practices of Ipiutak (1500-1100 BP) and Tigara (800-400 BP) hunter gatherers from Pointe Hope, Alaska . By comparing individuals of various biological maturation stages across regional populations to differences in burial form (i.e., body position, direction, depth, and grave goods), Justice and Temple (2019a, b) found that the spatial arrangement of grave goods suggests transitional social identities over the preadult life course. Positioning and orientation of the body was hypothesized to both reflect the "vulnerability" of preadults by placing individuals in a manner that associates them with multivariate stages, which gradually transitioned from "non-aware" identities to socially matured autonomy. Likewise, frequency of specific animal implements grave goods, such as animal-based ornaments and amulets, demonstrated the level of interaction that individuals had with non-human agents, such as associated human and non-human agents. These implements, over the life course, thus distinguished ascribed socioecological and cosmological relationships with society members in life and in death (Justice and Temple 2019a, b). Early appearance of such implements in preadult burials, as well as continual inclusion over generational interments, suggests that preadults

constituted significant roles in relationships with non-human agents that contributed to the ontology of group identity (Justice and Temple 2019a, b; Hill 2011, 2013).

The mortuary evaluation provided by Justice and Temple (2019a, b) demonstrates how preadult mortuary identity corresponds to unfolding ontological relationships in hunter-gatherer societies. As individuals mature, relationships with other sociocultural agents transform to coordinate with norms of autonomous interactions as well as significant socioecological maintenance of the human-natural environment (Cameron and Stock 2019; Ingold 2002, 2005; Pasarić and Warren 2019). These interactions include fulfillment of reciprocal relationships, in which the inclusion of animal agents into persistent mortuary practices insure continuous availability and cooperation between human and non-human agents. Here, preadult ontology reflects participation in such relationships associated with ascribed and achieved identities of interred preadults. This may include ideals of biosocial age, in which preadults of specific maturity participate in socioecological behaviors (i.e., hunting and processing of animal materials) or are cosmologically affiliated with animals (i.e., kinship organization or spiritual association) (Hill 2011, 2013; Justice and Temple 2019a, b). Such affiliations, however, vary in obtainment according to variation in hunter-gatherer ontology. For example, case studies of Jomon hunter-gatherers in Japan (16,500-2300 BP) demonstrated that frequent inclusion of animal implements correlate with patterned tooth ablation to indicate ontological systems of social maturation (Temple 2018b; 2019b). Appearance of specific antler hip ornaments and other decorative implements in burial contexts coincided with symbolic removal of teeth that occurred during specific ages of an individual's lifespan.

Continual placement of such implements in burial contexts following ecological and subsistence shifts towards the later Jomon cultural period indicates that persistent interactions with key non-human agents were an integral part of biosocial identity of maturing individuals. The Jomon perception of personhood, therefore, is inherently tied to relationships between human and non-human agents that coincide with recognition of age-based transitional biosocial identities in Jomon ideology (Kiriyama and Kusaka 2017; Temple 2018a, b; 2019b; Tsutaya et al. 2013).

Conclusions

The study of preadults in biological anthropology has remained a crucial factor in theoretical paradigms to properly address paleodemographic and sociocultural identity of past populations. At first, preadult individuals, specifically those of infant and childhood biological ages, were heavily regarded as "minor" reflections of mature populations and were neglected to be included in the archaeological record due to perceived insignificance towards understanding human variation. Insufficient curation and preservation also prevented in depth analysis of biomarker development, in which generalized age estimation methods based on limited preadult skeletal samples has greatly misrepresented population variation in biological age (Kamp 2021; Sofaer 2011). Contemporary bioarchaeological research has reoriented paradigms to articulate life history theory, as well as incorporate subsequent theories like the Developmental Origins of Health and Disease (DOHaD) that investigates the relationship of human plasticity during early life development and adulthood risk of terminal disease and early mortality (Agarwal and Beauchesne 2011; Halcrow and Tayles 2008; Inglis and Halcrow 2018).

However, proper articulation of life history and life course approaches must involve interpretation of social age in biological analysis. Age is a culturally defined and facilitated concept; therefore, cultural ideas of age-based behaviors, work, and identity within the adult social structure will directly affect physical indicators of biological age (Sofaer 2011; Justice and Temple 2019). In all, biocultural approaches can reveal how preadult remains encapsulate persistent identity in past societies.

Bioarchaeological studies of preadults have demonstrated that life history and biosocial approaches to human growth and development provide insightful evidence to the interdependence of biological aging and the embodiment of sociocultural experiences and identity, such as indicators of social autonomy. Social ontological beliefs integrate both biologically and culturally specific variables to establish social systems of agency within a cultural organization, whether through direct interaction between social agents, or through transitional life experiences that correlate to age and gender-based life phases and cultural ideology. Personhood, therefore, is thus presented in mortuary contexts through the creation of social identity through the treatment of human remains, including persistent spatial patterning of the mortuary landscape, the presence and placement of grave goods, and the variation of individual interments (Glencross 2011; Sofaer 2011; Weiss-Krejci 2011).

In turn, osteological variation presented by differences within preadult dental samples can indicate instances of life history strategies enacted by differential life course experiences within a population (Lorentz et al. 2019; Schwartz et al. 2006; Temple 2014). In the case of Indian Knoll, variation in the formation and eruption of mandibular

dentition (deciduous and permanent) may signify variation in biological maturation that may correlate to social maturation. While dental formation has consistently demonstrated to have the least amount of influence from environmental variation, developmental variation may result from variances in individual life courses and energetic buffering from early life stress events, particularly during key early life development. The implication of Western medical or scientific standards of age estimation and biological age progression may also conflict with non-Western systems of age, or impose western ideals of age-based behavior through the utilization of osteological standards (Justice and Temple 2019a; Neals and Seeman 205; Prowse 2011; Smith 2013).

This work is aimed to contextualize the ontology of personhood of preadults in the mortuary contexts of Late Archaic hunter-gatherers who occupied the Indian Knoll site. The goal of this thesis is to observe the mortuary practices of the Indian Knoll population to build a greater understanding of preadult life experiences during the Late Archaic period. Observations of mortuary patterning, grave good incorporation, and interment form suggest persistent identify within the burial context, in which preadult remains would reflect identities attained both in life and in death. Preadult identity, in this case, would be contingent on cultural ideations of personhood or biosocial maturation of Indian Knoll inhabitants. By using Indian Knoll as an in-depth case study, this thesis will also argue that bioarchaeological studies of past populations should evaluate human age identity according to contextual biosocial maturation rather than chronological systems of development (Justice and Temple 2019a).

CHAPTER 3: MATERIALS AND METHODS

Background

Located in Ohio County, Kentucky, Indian Knoll (15Oh2) has remained a key archaeological site in the Green River Valley since initial excavations began in the early 1910s. Indian Knoll is one of several prehistoric shell mound sites along the Green River drainage basin, such as the Carlston Annis site, (15Bt5), as well as other significant archaeological sites such as Mammoth Cave. Carbon and isotopic dating from shell midden samples place Indian Knoll's main occupation in the Late Archaic (5000-3000 B.P), which coincides with sample dating from the surrounding shell mound sites (Rodan 2020; Rothschild 1979; Webb 1974). Calibrated radiocarbon dating from both midden debitage and burial contexts place Indian Knoll's active timeframe between 5,590-4,530 cal. B.P. In total, over 1100 individuals have been recovered from multiple excavations, as well as significant assemblages of faunal and stone artifacts (Marquardt and Watson 2005; Paxson 2018; Webb 1974).

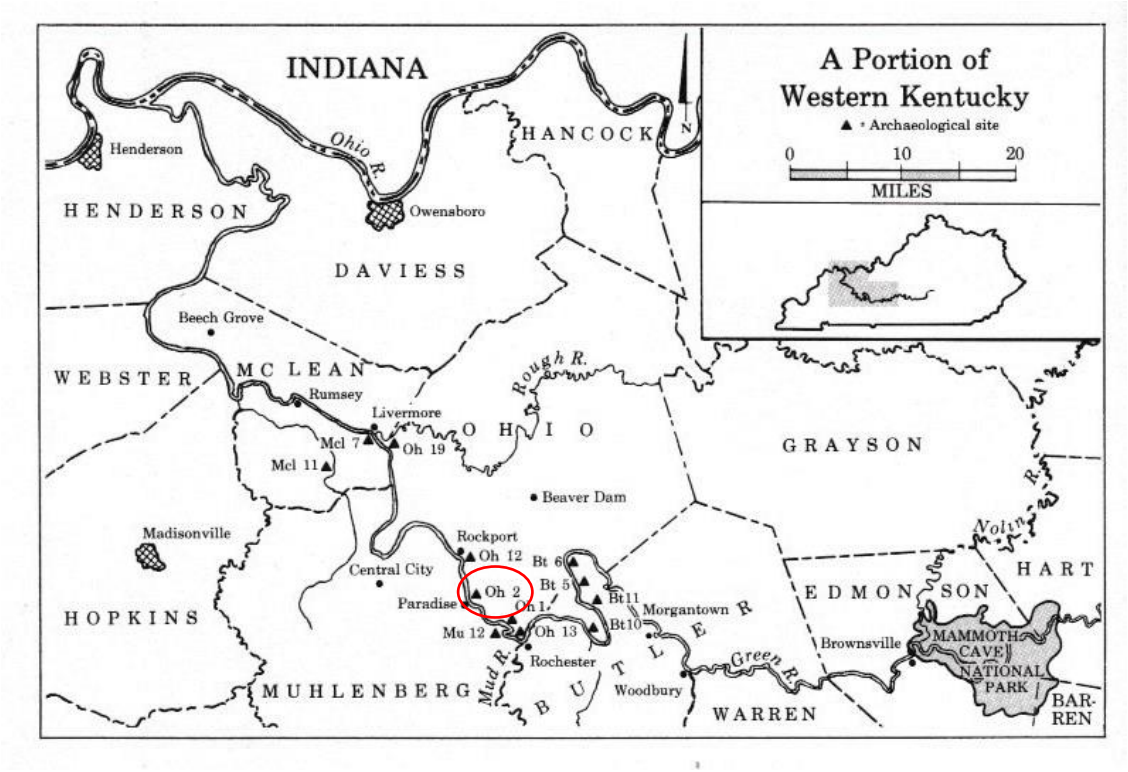


Figure 1. Geographical location of Indian Knoll (Oh2) in relation to other Green River Valley shell mounds (Webb 1974).

Prior to Indian Knoll's detection, the Green River Valley was identified by archaeologists as a major region of interest due to the high frequency of shell middens and villages found along the river basin. Clarence B. Moore began initial excavations of the site in 1915 in association with the Academy of Natural Sciences in Philadelphia. Reports from these efforts included the first documentation of large quantities of antler and stone implements, along with 298 burials with associated grave goods (Moore 1916; Webb 1974). However, Moore's excavations followed no set standards of recovery, which resulted in burial and artifacts without context. Moore's efforts also prioritized the excavation and collection of adult human remains, in which crania were targeted due to

institutional emphasis on phenotypic comparison of cultural groups in order to typological classify biological traits of cultural complexity. As a result, majority of the postcranial remains were ignored and preadult remains were disregarded in the context of Indian Knoll's mortuary landscape. Additional excavations were conducted in 1939 by the Works Progress Administration (WPA) following a severe flood that destroyed modern structures that were built on the mound. Lead by William S. Webb between 1939 and the early 1940s, secondary excavations were conducted to document the Indian Knoll site to supplement data gathered previously by Moore (1916) and as part of an archaeological survey of western Kentucky (Herrmann and Konigsberg 2002; Rodan 2020; Webb 1946; Wilham 2016). Webb's excavation yielded 880 burial contexts (articulated and disturbed) and roughly 55,000 artifacts recovered from the mound matrix and burials.

Several major excavations and studies followed Webb's WPA project, including William Marquardt and Patty Jo Watson's collective investigations of the Green River Valley shell mounds, or the Shell Mound Archaeological Project (SMAP). Like the SMAP, recent studies concerning Indian Knoll have focused on subsistence patterns of the Late Archaic hunter-gathers in order to determine seasonality of occupation and subsequent social behaviors, such as burial practices and regional sociocultural exchanges (Marquardt and Watson 2005; Paxson 2018; Rodan 2020). Indian Knoll, therefore, has remained a key site in anthropological study of the Eastern Archaic period, particularly in bioarchaeological and osteological studies of hunter-gatherer societies. Due to the large number of intact burials, bioarchaeologists have utilized Indian Knoll in

understanding the socioecological relationships between Late Archaic hunter-gathers and the environment. Investigations of Indian Knoll mortuary practices have speculated that the burial landscape reflects transformative sociocultural organization and identities over the site's active timeframe. Initial studies of the mortuary landscape suggest Indian Knoll reinforced regional egalitarian relationships, in which spatial patterning of burial contexts reflected biological relations and established persistent cultural landscapes by maintaining symbolic relationships with the deceased (Herrmann 2002; Rodan 2020; Rothschild 1979). Inclusion of grave goods, as well as differentiations in burial placement between the shell midden and residential areas, were thus seen as indicators of status or ascribed identities between related individuals (Classen 2019; Rothschild 1979).

Studies of dental wear and midden debris also hypothesized that, while Indian Knoll occupants gradually diversified subsistence patterns as more sedentary habitation practices were adopted, consumption of local fauna and freshwater shellfish constituted most Indian Knoll dietary pattern (Marquardt and Watson 2005; Nealis and Seeman 2015; Rodan 2020). Evidence of expanding subsistence patterns proposed socioecological and osteological adaptations to changing environments, particularly in the form of population health and paleodemographics. Preadult skeletal remains, therefore, constituted a major factor in osteological and dental comparisons of health and growth trajectories both throughout Indian Knoll's occupation and regional populations in the Green River Valley. Age-at-death assessments were collected during both Webb's WPA excavation by Charles E. Snow (1948) to understand basic demographic trends. Snow's estimations were based on several taphonomic measurements, including cranial

suture closure, dental morphology, and pubic symphysis metrics in correlation to biological sex estimations. However, reevaluation of the original age reports demonstrated that initial observations had underaged the Indian Knoll population. Following newly established methods (i.e., standardized dental attrition and three-component pubic symphysis system), total age distribution had increased the total number of individuals over 30 years while decreasing adults 50 years and over (Herrmann 2002; Herrmann and Konigsberg 2002; Rothschild 1979). Age distribution of the Indian Knoll population has continuously been reassessed due to advances in modern osteological and dental estimation methods. These new methods have not only proved essential to continual bioarchaeological investigations of osteological variation, such as biodistance analysis and morphological development (Rodan 2020; Thomas 2011; Walker 1997), but also in the scope of social behavior embodied through persistent or shifting cultural mortuary practices.

Materials

This research drew from the Indian Knoll (15Oh2) skeletal collections at the William S. Webb Museum in association with the University of Kentucky in Lexington. Skeletal and burial comparisons were completed using two forms of data: radiograph imagery and site excavation reports. Dr. Libby Cowgill of the University of Missouri provided dental radiographs. The sample included 86 images of lower mandibular dentition. All individuals were previously identified as preadults during initial recording. Only one image was observed per individual. However, due to image clarity issues or contextual error, three individuals were excluded from the final analysis. The final total

of the preadult sample is 83 (Table 3). The mandibular dentition was selected for this research as dental metrics are more resistant to environmentally-caused developmental variation. Timing and ontogeny of the dental arcade, both deciduous and permanent, is highly correlated to specific points in biological maturation, which provide a highly accurate method of identifying maturation age (Dahlberg 1945; Smith 2013; Wolfe and Herrmann 2022). Burial information was recorded for all known individuals recovered at Indian Knoll using published site reports from original excavations (Marquardt and Watson 2005; Webb 1974). Initial observations of burial information were taken from Webb (1974); which later compared to Marquardt and Watson (2005) to ensure all contexts were recorded with updated information. In total, 880 burial contexts were recorded for this research; however, 846 were used for final burial interpretation. The remaining 34 individuals constituted disturbed contexts in which the remains were poorly preserved and could not be properly identified (Marquardt and Watson 2005; Webb 1974).

Methods

Dental Identification and Estimation

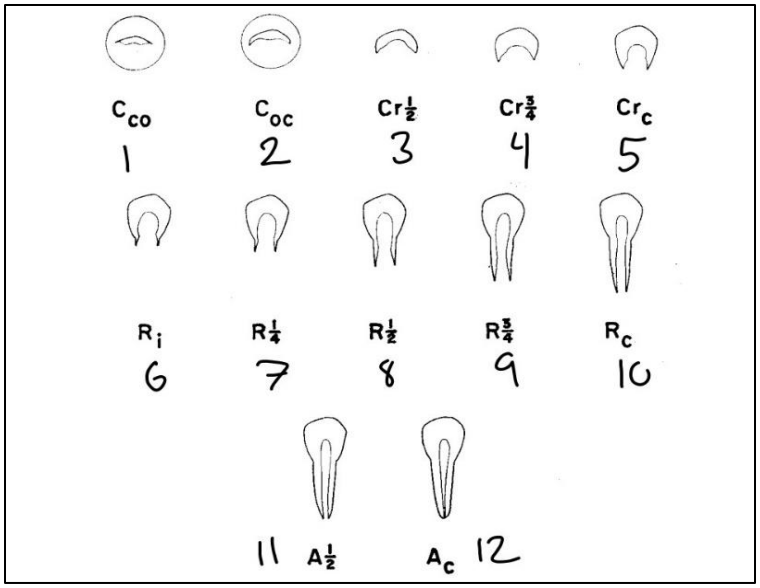
The initial phases of this research included the selection and recording of a sample population of preadults from the Indian Knoll site. The x-ray images provided were pre-selected, as the database drawn from was established by prior studies. The next step was to identify both present dentition in each image and estimated stage of development in order to determine age. Both deciduous and permanent dentition were recorded for each image based on standard morphology of the lower mandible arcade

(AlQahtani et al. 2010; Moorrees et al. 1963a, b, Smith 1991). Missing teeth were taken note of, but not considered in the final analysis.

Dental age assessment was conducted with the focus of not assigning a numbered age to each individual, but rather estimating the progression of biological maturation at the time of death. Root-crown developmental stages were determined for both deciduous and permanent teeth using the standards of formation and eruption for single-rooted teeth and molars established by Moorrees et al. (1963a,b). Each tooth was assigned both a coded abbreviation and sequential number in Excel that correlates to the different stages of crown- root formation, eruption, and resorption. To account for the variation in timing and possible biases in using a single method of age estimation, maturation age was calculated using the averages between the estimated age of attainment and age of formation (AlQahtani et al. 2014; Smith 1991). For each method, numbered phases were compared to determine extent of development, in which the tooth demonstrating the highest level of formation was selected for each individual. The ages of attainment and formation were taken using recorded age observations published in Smith (1991). Biological sex estimations and any inferred gender identity was not provided for the preadult population; therefore, sex and gender were not considered for dental age assessment and ages were listed as ranges for each method. Sex and gender identity was not considered for individual cases in burial analysis as well due to inconsistent sex identification between site reports and the high rates of unidentifiable or disturbed preadult remains (Marquardt and Watson 2005). The average of these age ranges was

recorded for each individual and calculated further into one possible age between attainment and formation.

Final age assessment was conducted using the methods detailed in AlQahtani et al. (2010). Here, preadults were assigned to one of several age ranges according to final possible age. Ranges began at prenatal to half a year (0-0.5 years) and continue in 1 year increments up to 19.5 years (18.5-19.5 years). The total count (N) of each tooth type was listed for each range. Each tooth type was then assessed on observed formation, in which the minimum, median, and maximum stage of development was recorded. Average completed tooth development was based on the first appearance of the 14^{th} stage, or *Ac*, as the maximum value (earliest age possible) and the minimum (latest age possible). Complete mandibular development was determined when all teeth were recorded as *Ac* for all three values.



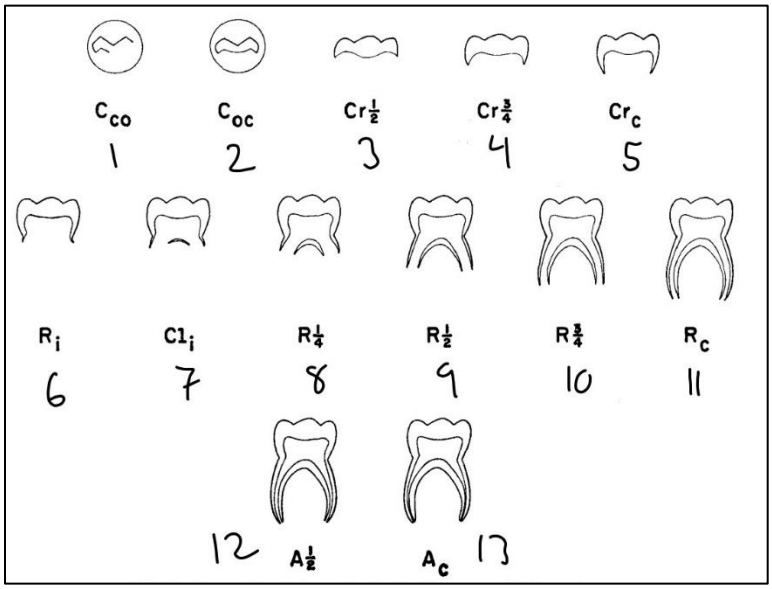


Figure 2. Numbered phases of deciduous single-rooted tooth and molar formation (Moorrees et al. 1963a)

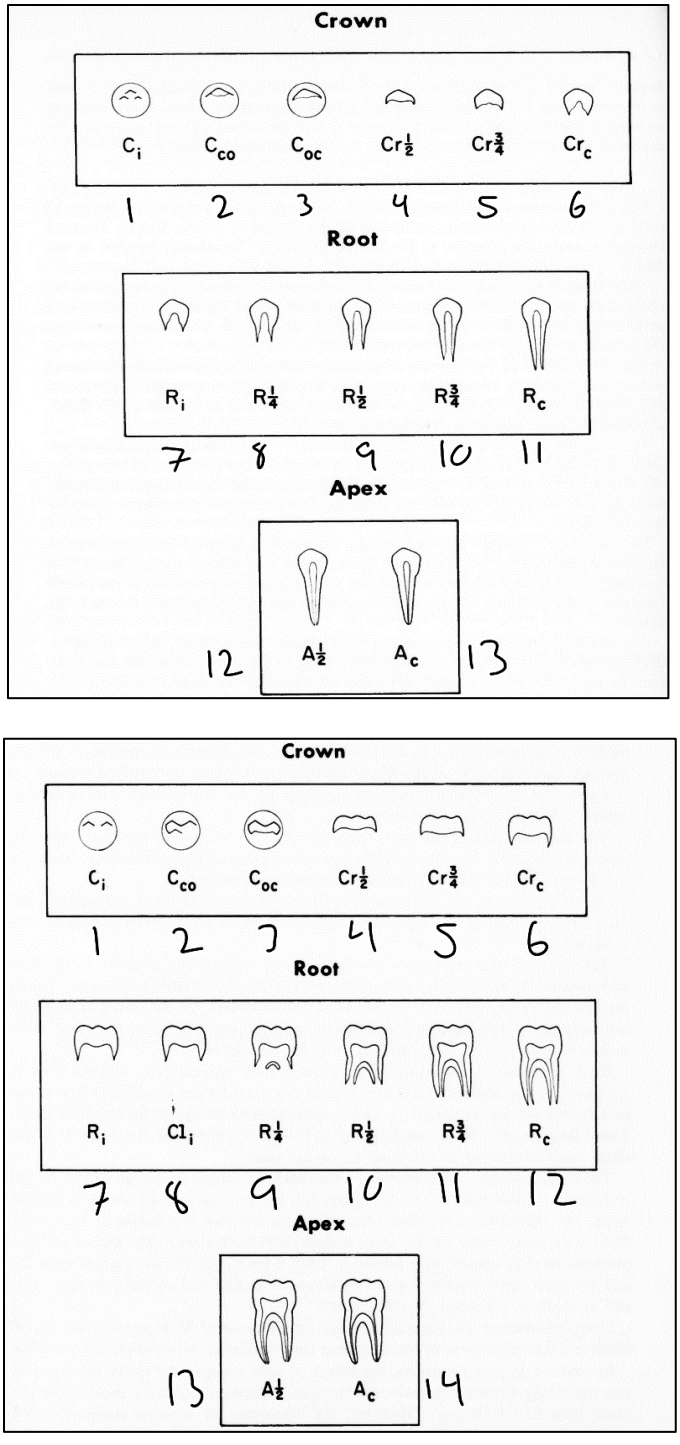


Figure 3. Numbered phases of permanent single-rooted tooth and molar formation (Moorrees et al. 1963b).

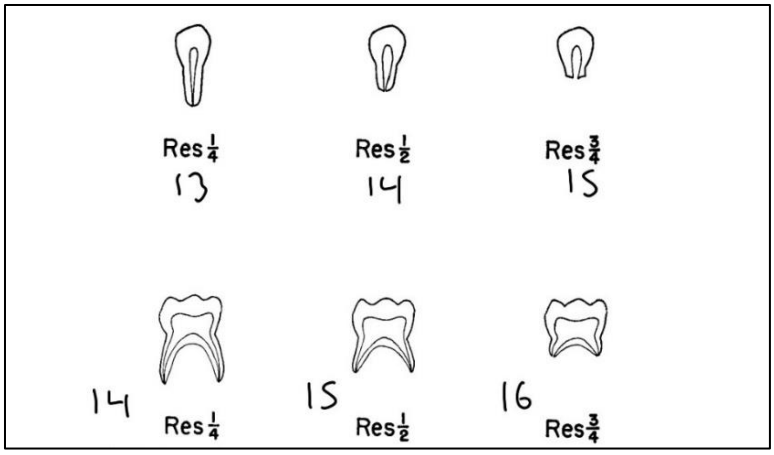


Figure 4. Numbered phases of deciduous tooth resorption (Moorrees et al. 1963a).

Mortuary Analysis

Burial data for Indian Knoll was organized according to burial context: preadults included in the sample population used for dental assessment, other identified preadults, adults, and unidentified individuals. Each individual was also organized into a specific age group. These groups were organized according to age intervals described in Webb (1974) and Marquardt and Watson (2005), and assigned based on recorded age estimation from site reports or dental estimations. Categories included Age Group 1 (0-3 years), Age Group 2 (4-12 years), Age Group 3 (13-17 years), Age Group 4 (18-35 years), and Age Group 5 (35-50+ years). All available burial data was recorded for all contexts: biological sex estimations, burial depth, orientation, position, associated burials, and grave good presence or absence. All data was copied from excel spreadsheets to SPSS entries for statistical graphing and assessment. The full list of burial information is listed in Supplemental Table 1A at the end of this paper. Box plots, bar graphs, and frequency

tables were calculated for both data sets (dental sample population and whole site) to compare burial forms and cases of grave goods between age groups.

A second burial analysis was conducted for the preadult sample population using dental developmental milestones. By comparing burial form to dental milestones, chronological age assumptions are not factored into the mortuary practices of Indian Knoll. Therefore, age-based identity can be examined according to biological maturation, in which specific traits of biological aging are affiliated with preadult identity over the course of early life experiences. Preadults were organized according to two developmental milestones: last crown completion and last root completion. Teeth were arranged according to appearance on the dental arcade; however, it is important to note timing of specific tooth development (i.e., first permanent molar) Individuals too young to possess completed teeth or had missing teeth were recorded as "incomplete" (INC). Both crown and root completion were compared to burial positioning and orientation, as well as the presence or absence of grave goods. In-depth grave good analysis was conducted focusing only on the frequency of beads, animal implements, and stone implements.

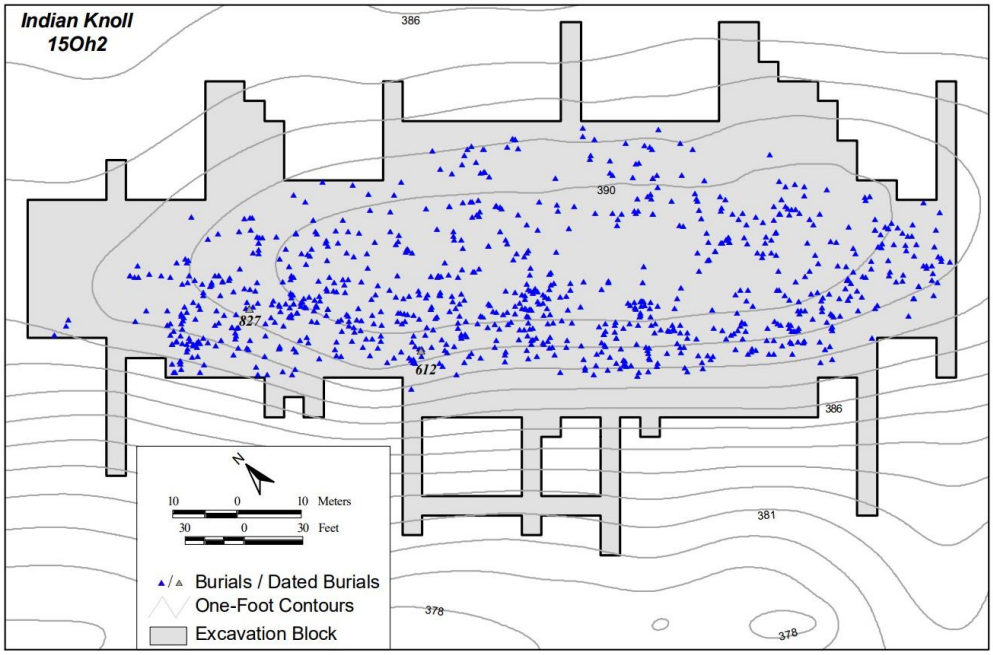


Figure 5. Layout of burial contexts and excavation block (Herrmann 2002).

To assess age-based relationships between associated burials, contexts with multiple interments were analyzed separately. Associated individuals were assigned to one burial group number, and listed alongside estimated age (in years) and age group. Burial groups were organized into box plots according to the estimated ages of individuals. Burials groups were also graphed into Box-Dot plots using R to depict the number of individuals per burial group for visual comparison. Number of individuals per context and distribution of age (in years) between individuals were assessed for resulting analysis.

Grave good assemblages in burial contexts can convey culturally-specific identities, including life experiences and age-based identities that are incorporated into

symbols of specific social relationships between cultural agents (Justice and Temple 2019b; Sofaer-Deverenski 2000). While recording burial data, specific grave goods types were noted to occur in tandem with other types. Comparisons were conducted between distinct grave good classifications: red ochre, beads, animal implements, stone implements, textiles, and metal or mineral implements. Animal implements were defined as any object (except for beads) made from animal material, such as bone, antler, tooth, or shell. Stone implements were defined similarly, and comprise objects such as groundstone tools, projectile points, or any altered stone. A Pearson 2-tailed correlation test and pairwise statistics were conducted to indicate significant correlation between grave good types, or if the presence of one type of grave good is dependent on the presence or absence of another. Specific contexts with high counts of multiple types of grave good was also listed.

Potential biases that must be considered for this research mostly lie in the populational representation of Indian Knoll in the mortuary landscape. Individuals provided for the dental analysis, stated before, were a preselected group that were radiographed by an outside party. While heterogenous rates of deciduous tooth development and shedding may be reflective of preadult life course stress and health, considerations must be made that observed variations is the result of hidden heterogeneity in individual dentition development or unknown factor(s) that effected rate of shedding and permanent tooth formation (DeWitte and Stojanowski 2015; Moorrees et al. 1963; Wood et al. 1992). Again, site-wide disturbance of burial contexts and inconsistent excavation methods from previous projects may be another source of skewedness in the

mortuary analysis. Human error in recording, graph creation, and statistical analysis of the data presented must also be taken into consideration.

Table 1. Categories used for recording age groups (in years), burial position, and orientation.

Age Group				**Position**		**Orientation**	
NB	Newborn	< 0	1	B	Supine	S	Sitting
I	Infant	0-3		R	Right Side	F	Flexed
C	Child	4-12	2	L	Left Side	P	Partially Flexed
A	Adolescence	13-17	3	Fa	Prone	E	Extended
YA	Young Adult	18-35	4	D	Disturbed	D	Disturbed
MA	Middle Adult	35-55	5				
OA	Older Adult	55+	6				

Table 2. Abbreviations used for mandibular tooth identification.

Deciduous		**Permanent**	
m1	1st molar	P1	1st premolar
m2	2nd molar	P2	2nd premolar
		M1	1st molar
		M2	2nd molar
		M3	3rd molar

Table 3. Burial data for preadult sample used for dental analysis.

Burial #	Mean Est. Age	Age Group	Orientation	Position	Multiple Interment	Grave Goods
3	15	3	FLEXED	SUPINE	N	PRESENT
5	17	3	PARTIAL	SUPINE	N	PRESENT
46	17	3	PARTIAL	SUPINE	N	ABSENT
47	14	3	FLEXED	LEFT SIDE	N	PRESENT
48	5	2	PARTIAL	SUPINE	N	PRESENT
54	6	2	FLEXED	SUPINE	N	PRESENT
59	14	3	FLEXED	LEFT SIDE	Y	PRESENT
62	0	1	PARTIAL	SUPINE	N	ABSENT
78	3	1	FLEXED	LEFT SIDE	N	ABSENT
86	5	2	FLEXED	LEFT SIDE	N	ABSENT
95	12	2	FLEXED	SUPINE	N	ABSENT
97	16	3	FLEXED	SUPINE	Y	PRESENT
125	14	3	FLEXED	LEFT SIDE	N	ABSENT
127	15	3	FLEXED	RIGHT SIDE	N	ABSENT
136	15	3	FLEXED	LEFT SIDE	N	ABSENT
138	13	3	FLEXED	LEFT SIDE	N	ABSENT
149	1	1	PARTIAL	SUPINE	N	PRESENT
153	12	2	FLEXED	RIGHT SIDE	N	PRESENT
169	15	3	FLEXED	RIGHT SIDE	N	ABSENT
170	14	3	FLEXED	SUPINE	N	ABSENT
172	7	2	FLEXED	RIGHT SIDE	N	PRESENT
176	1	1	PARTIAL	SUPINE	N	ABSENT
196	2	1	DISTURBED	DISTURBED	N	ABSENT
199	2	1	PARTIAL	LEFT SIDE	N	ABSENT
211	5	2	PARTIAL	SUPINE	N	ABSENT
215	20	4	FLEXED	LEFT SIDE	N	PRESENT
219	13	3	DISTURBED	DISTURBED	N	PRESENT
224	2	1	FLEXED	SUPINE	N	ABSENT
225	3	1	FLEXED	SUPINE	N	PRESENT
232	11	2	FLEXED	RIGHT SIDE	N	ABSENT
236	14	3	FLEXED	PRONE	Y	PRESENT
244	8	2	PARTIAL	SUPINE	N	ABSENT
245	10	2	FLEXED	SUPINE	N	PRESENT
248	2	1	PARTIAL	SUPINE	Y	PRESENT
253	13	3	FLEXED	SUPINE	Y	PRESENT
264	4	2	FLEXED	SUPINE	N	PRESENT
265	0	1	PARTIAL	SUPINE	N	ABSENT
276	3	2	FLEXED	RIGHT SIDE	Y	ABSENT
278	14	3	FLEXED	RIGHT SIDE	N	PRESENT
279	1	1	PARTIAL	SUPINE	N	PRESENT
286	3	1	PARTIAL	PRONE	N	ABSENT
287	5	2	PARTIAL	LEFT SIDE	N	ABSENT

289	17	3	FLEXED	LEFT SIDE	N	ABSENT
304	2	1	FLEXED	SUPINE	Y	ABSENT
315	15	3	FLEXED	SUPINE	N	PRESENT
339	3	1	FLEXED	RIGHT SIDE	N	PRESENT
350	13	3	FLEXED	SUPINE	N	ABSENT
354	10	2	FLEXED	RIGHT SIDE	N	PRESENT
384	11	2	FLEXED	LEFT SIDE	Y	ABSENT
386	5	2	FLEXED	SUPINE	N	ABSENT
453	6	2	FLEXED	PRONE	Y	ABSENT
444	9	2	FLEXED	SUPINE	N	ABSENT
472	10	2	FLEXED	RIGHT SIDE	N	ABSENT
488	15	3	FLEXED	PRONE	N	ABSENT
495	16	3	FLEXED	SUPINE	N	PRESENT
501	15	3	FLEXED	SUPINE	N	PRESENT
503	3	1	FLEXED	LEFT SIDE	N	PRESENT
515	3	1	FLEXED	SUPINE	N	PRESENT
523	10	2	FLEXED	RIGHT SIDE	N	PRESENT
530	5	2	FLEXED	LEFT SIDE	N	ABSENT
566	8	2	FLEXED	RIGHT SIDE	Y	ABSENT
567	17	3	FLEXED	LEFT SIDE	N	ABSENT
571	7	2	EXTENDED	SUPINE	N	PRESENT
589	14	3	FLEXED	PRONE	N	ABSENT
596	14	3	PARTIAL	RIGHT SIDE	N	PRESENT
599	7	2	FLEXED	LEFT SIDE	N	PRESENT
618	14	3	PARTIAL	RIGHT SIDE	N	PRESENT
664	9	2	PARTIAL	LEFT SIDE	N	ABSENT
691	7	2	FLEXED	RIGHT SIDE	Y	PRESENT
692	10	2	PARTIAL	SUPINE	Y	ABSENT
694	7	2	PARTIAL	SUPINE	Y	ABSENT
724	6	2	PARTIAL	SUPINE	N	ABSENT
740	10	2	FLEXED	LEFT SIDE	N	PRESENT
751	14	3	FLEXED	LEFT SIDE	N	PRESENT
770	7	2	PARTIAL	RIGHT SIDE	N	ABSENT
785	7	2	PARTIAL	LEFT SIDE	N	PRESENT
796	15	3	FLEXED	RIGHT SIDE	N	PRESENT
815	6	2	PARTIAL	PRONE	N	PRESENT
822	12	2	PARTIAL	RIGHT SIDE	Y	PRESENT
826	8	2	FLEXED	RIGHT SIDE	N	ABSENT
836	20	4	PARTIAL	RIGHT SIDE	N	PRESENT
842	7	2	FLEXED	LEFT SIDE	N	PRESENT
855	7	2	PARTIAL	SUPINE	N	ABSENT

CHAPTER 4: RESULTS

Dental Assessment of Preadult Sample

In total, 380 teeth were observed from the radiograph sample; amounting to 89 deciduous and 291 permanent teeth. Table 4 shows the final age estimations based on observed developmental phases. Initial observations of total counts and phase differences suggest that the average chronological age difference between age of attainment and age of formation is 1-2 years. Table 5 shows the observed phases according to final age estimations (the mean of attainment and formation ages). The modal age estimation was is 14.5 years. While all age categories for Table 5 had at least one recorded case per tooth, results from the final age assessment had several missing elements for individuals estimated between 12.5 and 13.5 years.

Assessment of developmental phases in the Indian Knoll preadult sample indicates slight deviations in the timing of deciduous molars. Between prenatal ages and 1.5 years, first and second deciduous molars demonstrates varied stages of crown formation and eruption, with only a select few individuals showing advanced phases of root formation. First deciduous molars, however, demonstrated more concise timeframe of crown-root formation, in which tooth completion ranges between 1.5 and 3.5 years. On the other hand, second deciduous molars show varied rates of crown-root completion

between 1.5 years and 6.5 years. Both molars vary in resorption up until last evidence of deciduous teeth in individuals aged to around 11.5 years.

Developmental patterns in permanent dentition show more precise timing between tooth developmental phases, where only two to three different phases are observed per tooth for each age category. Th earliest observations of first molar formation in the mandibular cavity fall under the 0–6-month age category, in which only the first (Ci) or second (Cco) stages of molar cusp formation have begun. First permanent premolars are observed as early as 1.5 years; however, only one tooth is recorded at this age category. Age of completeness for each mandibular permanent tooth shows precise timing across individuals with only 1 year difference in terminating phases. The only exception to this is pattern is the first molar, which ranges in completeness between 9.5 years and 11.5 years. Development of the third molar finishes between 19.5 and 20.5 years, which corresponds with the competition of all other mandibular dentition.

Table 4. Preadult sample with estimated dental age of attainment, age of formation, and average age (years).

Burial	*Age of Attainment (Est)*	*Age of Formation (Est)*	*Mean (Est)*
3	14.8	14.1	14.5
5	16.5	16.7	16.6
46	17	17.6	17.3
47	14.8	13.7	14.3
48	5.2	5.5	5.4
54	5.9	6.5	6.2
59	13.6	14.1	13.9
62	0.4	0.4	0.4
78	3	2.3	2.7
86	5.3	5.5	5.4
95	11.5	12.2	11.9
97	15.4	15.9	15.7
125	13.6	14.1	13.9
127	14.8	15	14.9
136	14.8	14.1	14.5
138	12.7	13.7	13.2
149	0.7	0.5	0.6
153	11.5	12.1	11.8
169	14.7	15	14.9
170	13.6	13.7	13.7
172	6.7	7.6	7.2
176	0.2	1.5	0.9
196	1.8	2.1	2
199	1.8	2.2	2
211	4.4	4.8	4.6
215	20.4	19.3	19.9
219	12.7	13.7	13.2
224	2.2	2.5	2.4
225	2.3	3.3	2.8
232	10.6	10.8	10.7
236	14.8	13.7	14.3
244	7.9	8.6	8.3
245	9.3	9.7	9.5
253	12.7	13.7	13.2
264	3.8	4.2	4

265	0	0.2	0.1
276	3	3.3	3.2
278	14	13.7	13.9
279	1.1	1.3	1.2
286	3.1	1.9	2.5
287	5	5.3	5.2
289	16.5	16.7	16.6
304	0.9	2.1	1.5
315	14.7	15	14.9
339	2.8	3.3	3.1
350	12.8	13.7	13.3
354	10	10.5	10.3
384	11.1	11.2	11.2
386	4.8	5.3	5.1
444	9.3	8.4	8.9
472	9.9	10.2	10.1
488	14.7	15	14.9
495	15.4	15.9	15.7
501	14.8	14.1	14.5
503	2.3	2.6	2.5
515	3	3.3	3.2
523	9.5	9.7	9.6
530	5.2	5.5	5.4
567	17	17.6	17.3
571	6.7	6.6	6.7
589	14.8	13.7	14.3
596	14.8	13.7	14.3
599	6.3	6.8	6.6
618	13.6	14.1	13.9
664	9.1	8.2	8.7
691	6.7	7.6	7.2
692	9.6	9.9	9.8
694	5.9	7.3	6.6
724	5.9	6.3	6.1
740	9.9	10.2	10.1
751	14.8	13.7	14.3
770	6.3	6.6	6.5
785	6.7	7.6	7.2
796	14.8	15	14.9

815	5.3	6.6	6
822	11.5	12.1	11.8
826	7.3	8.2	7.8
836	20.4	19.3	19.9
842	6.7	7.6	7.2
855	6.3	6.6	6.5
248	1.7	2.1	1.9
453	5.9	6.3	6.1
566	7.9	8.6	8.3

Table 5. Recorded tooth development phases by estimated average age (years).

Age (years)	Tooth	Count	Min	Median	Max
0-0.5	m1	2	Crc	Cli	Cli
	m2	2	Coc	Cr3/4	Cr3/4
	M1	2	Ci	Cco	Cco
1.5	m1	4	Cr1/2	Ri	Ac
	m2	3	Crc	R1/4	Ac
	P1	1	Ci	Ci	Ci
	M1	3	Ci	Cco	C1/2
2.5	m1	6	R3/4	A1/2	Ac
	m2	6	R1/4	Rc	Res1/4
	P1	3	Ci	Ci	Cco
	M1	4	Cr3/4	Crc	Crc
3.5	m1	5	Ac	Ac	Ac
	m2	5	R1/2	A1/2	Ac
	P1	5	Cco	Coc	Coc
	P2	3	Ci	Ci	Ci
	M1	4	Cr3/4	Ri	Ri
4.5	m1	\	\	\	\
	m2	1	R1/4	R1/4	R1/4
	P1	\	\	\	\
	P2	\	\	\	\
	M1	1	Cr1/2	Cr1/2	Cr1/2
	M2	1	Cco	Cco	Cco
5.5	m1	5	Ac	Ac	Res1/2
	m2	6	A1/2	Ac	Ac
	P1	5	Cr3/4	Crc	Crc
	P2	4	Ci	Cco	Cr3/4

	M1	5	Crc	Cli	R1/4
	M2	4	Coc	Cr1/2	Cr1/2
6.5	m1	7	Ac	Ac	Res1/4
	m2	6	Ac	Ac	Ac
	P1	7	Crc	Ri	Ri
	P2	7	Cco	Cr3/4	Crc
	M1	6	Cli	R1/4	R3/4
	M2	6	Cco	Coc	Cr3/4
7.5	m1	7	Ac	Res1/4	Res1/2
	m2	7	Ac	Ac	Res1/4
	P1	7	Ri	R1/4	R1/4
	P2	7	Cr3/4	Crc	Ri
	M1	7	R1/4	R3/4	Rc
	M2	7	Cr1/2	Cr3/4	Crc
8.5	m1	2	Ac	Res1/2	Res1/2
	m2	3	Ac	Ac	Res1/4
	P1	3	Ri	R1/4	R1/4
	P2	3	Crc	Ri	Ri
	M1	3	A1/2	A1/2	A1/2
	M2	3	Crc	Cli	Cli
9.5	m1	1	Res1/4	Res1/4	Res1/4
	m2	3	Ac	Ac	Res1/4
	P1	1	R1/4	R1/4	R1/4
	P2	3	Ri	R1/4	R1/4
	M1	3	A1/2	Ac	Ac
	M2	3	Ri	R1/4	R1/4
10.5	m1	3	Ac	Res1/2	Res1/2
	m2	5	Ac	Ac	Res1/4
	P1	6	Crc	R1/2	R3/4
	P2	6	Cr3/4	R1/4	R1/2
	M1	6	R1/4	A1/2	Ac
	M2	6	C1/2	R1/4	R1/2
	M3	3	Ci	Cco	Cco
11.5	m1	1	Res1/4	Res1/4	Res1/4
	m2	1	Res1/4	Res1/4	Res1/4
	P1	1	R1/2	R1/2	R1/2
	P2	1	R1/2	R1/2	R1/2
	M1	2	Ac	Ac	Ac
	M2	2	R1/2	R3/4	R3/4
	M3	1	Coc	Coc	Coc
12.5	P1	3	Rc	A1/2	A1/2
	P2	3	R3/4	R3/4	Rc

	M1	3	Rc	Ac	Ac
	M2	3	R1/2	Rc	Rc
	M3	2	Cco	Cr3/4	Cr3/4
13.5	P1	3	Rc	A1/2	Ac
	P2	3	R3/4	A1/2	A1/2
	M1	4	Ac	Ac	Ac
	M2	4	A/12	A1/2	A1/2
	M3	4	Coc	Cr3/4	Ri
14.5	P1	8	Ac	Ac	Ac
	P2	10	A1/2	Ac	Ac
	M1	12	Ac	Ac	Ac
	M2	12	R3/4	Ac	Ac
	M3	13	C3/4	Ri	R1/4
15.5	P1	3	Ac	Ac	Ac
	P2	4	A1/2	Ac	Ac
	M1	4	Ac	Ac	Ac
	M2	2	Ac	Ac	Ac
	M3	5	R1/4	R1/4	R1/4
16.5	P1	2	Ac	Ac	Ac
	P2	2	Ac	Ac	Ac
	M1	2	Rc	Ac	Ac
	M2	2	A/12	Ac	Ac
	M3	2	R1/2	R1/2	R1/2
17.5	P1	\	\	\	\
	P2	3	Ac	Ac	Ac
	M1	4	Ac	Ac	Ac
	M2	4	Rc	Ac	Ac
	M3	4	R3/4	Rc	Rc
19.5	P1	\	\	\	\
	P2	1	Ac	Ac	Ac
	M1	1	Ac	Ac	Ac
	M2	1	Ac	Ac	Ac
	M3	1	Ac	Ac	Ac
20.5	P1	1	Ac	Ac	Ac
	P2	1	Ac	Ac	Ac
	M1	1	Ac	Ac	Ac
	M2	1	Ac	Ac	Ac
	M3	1	Ac	Ac	Ac

Mortuary Analysis of Preadult Sample

Demographic Variation and Burial Placement

The distribution of estimated ages for the Indian Knoll preadult sample falls between four out the five total age categories established for this study. Figures 6 and 7 details the number of individuals per age group and frequencies of age distribution. Sample mean age equaled to 9.2 years, with quartile values set at approximately 5 and 14 years. The youngest individual aged to about .10 years, while the oldest was calculated to be about 19.9 years. Group 2 comprised the largest number of individuals (N= 37, $\bar{x}$ = 7.6), followed by Group 3 (N = 28, $\bar{x}$= 14.6) and Group 1 (N = 16, $\bar{x}$ = 1.8). Only two individuals aged into Group 4, with a mean age of 19.9 years.

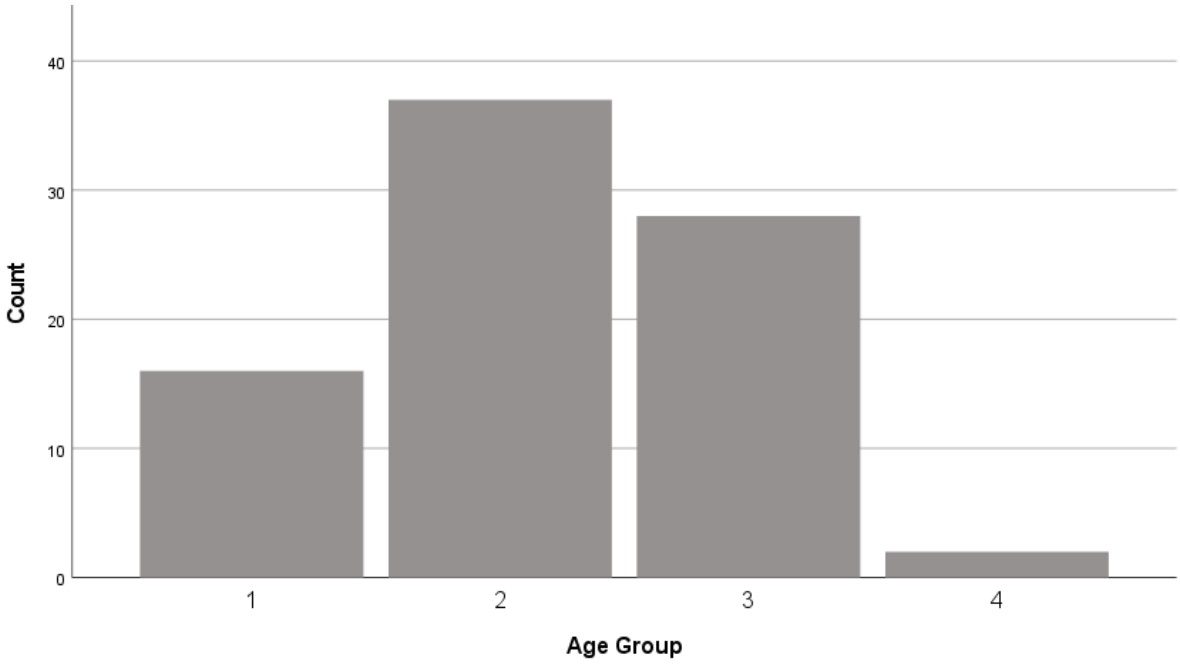


Figure 6. Number of individuals per age group.

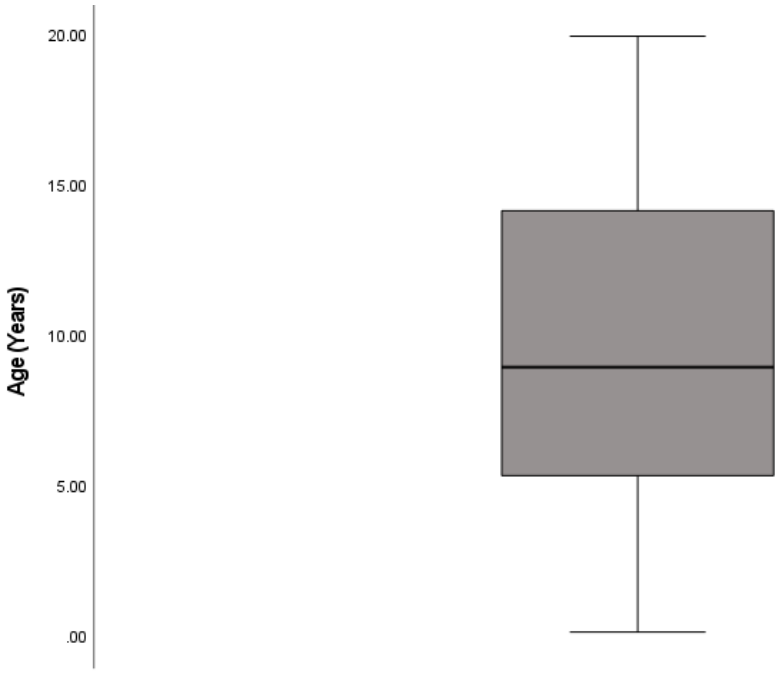


Figure 7. Distribution of average ages across sample population.

Assessment of burial positioning, shown in Figures 8 and 9, followed trends established by the age distribution described previously, or that observation of cases numbers follows the same order of age groups from most individuals to fewest. Two individuals were listed as being disturbed in the burial context; therefore, the total number of individuals used for this assessment was 81. For all age groups, the most common positioning for interments was supine (N = 34). Total cases of left-side (N = 21) and right-side (N = 20) facing interments was about equal; however, Group 2 demonstrated more cases of right-facing interments, whereas other age groups favored left-facing positioning. Of the only cases of prone positioning, Group 3 possessed the most cases (N = 3), followed by Group 2 (N = 2) and finally in Group 1 (N = 1). Means analysis of burial positions suggests a close correlation between prone, left-side, and right-side positioned individuals ($\bar{x}$ = 10 years). The quartiles for prone and left-side positioning are presented as nearly overlapping, indicating that these burial forms are observed equally in these average ages. The lower quartile for right-side placement, however, lies closer to the mean for all three compared forms, indicating that right-side positioning is more frequent in older average ages. Supine positioning demonstrates the greatest distribution with a mean of 7.7 years and a lower quartile extending between 3-4 years. The upper quartile is about equally with those of the other forms of burial positions.

Figures 10 and 11 depict burial orientation forms. Observations of orientations demonstrate higher rates of variability between age group than burial positions. The most common orientation was flexed (N = 54), followed by partially-flexed individuals (N =

26). Only one case of extended burial form is represented in Group 2. The number of recorded flexed individuals were almost evenly distributed between Groups 2 and 3 (approximately N = 23) with a decrease in the number of partially-flexed individuals between groups. Conversely, partially-flexed individuals account for most observed orientations in Group 1, although only by a few cases in comparison to flexed individuals. Group 4 was evenly distributed between flexed and partially-flexed. Frequency analysis of burial orientation forms shows that flexed orientation has a mean average age of 10.3 years, while partially-flexed stands at 7.1 years. The single extended individual is aged around 6.7 years. When comparing combined position-orientations patterns in the preadult sample, the two most frequent body placements were flexed-supine (N = 18) and flexed-left side (N = 17). The third most frequent placement is partially-flexed and supine (N = 15). The one case of extended orientation also correlates to supine positioning.

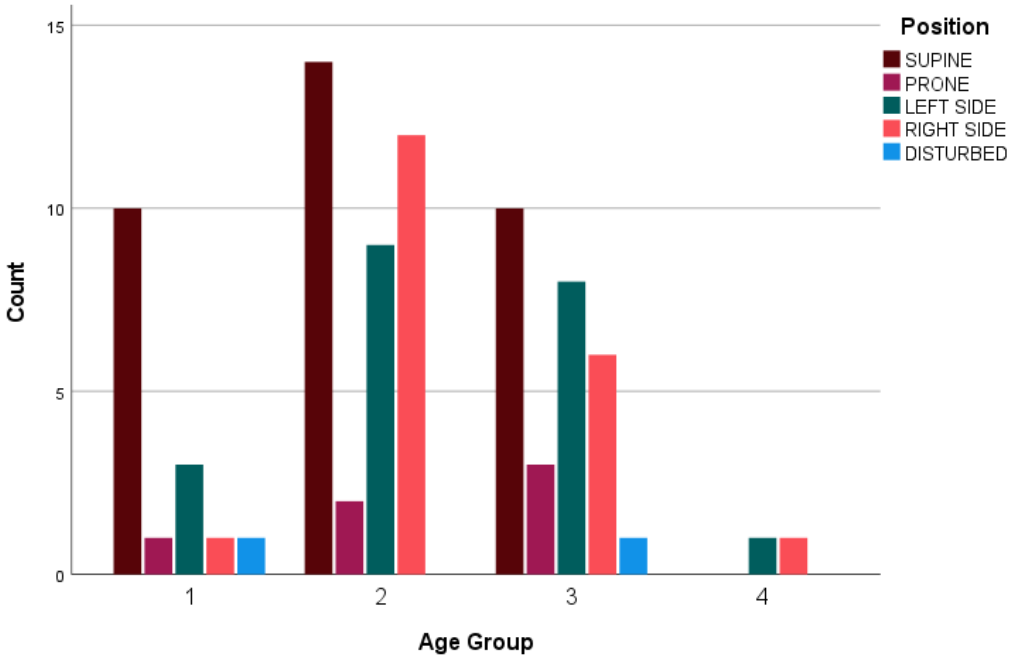


Figure 8. Cases of burial position per age group.

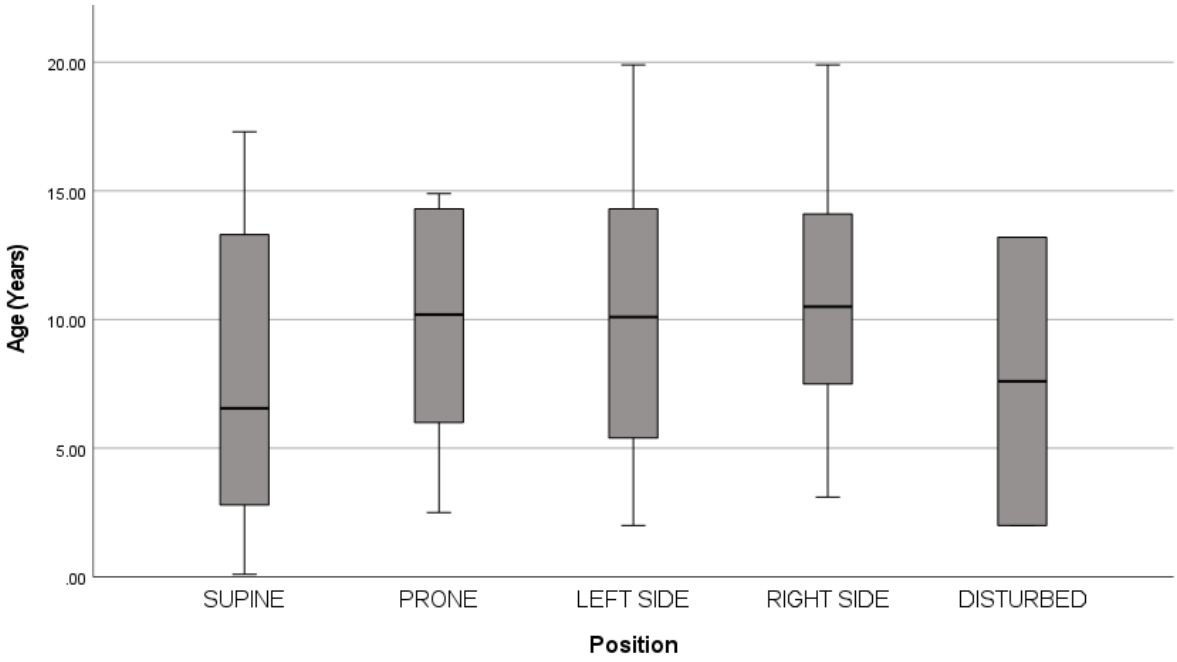


Figure 9. Frequency of burial position across average ages

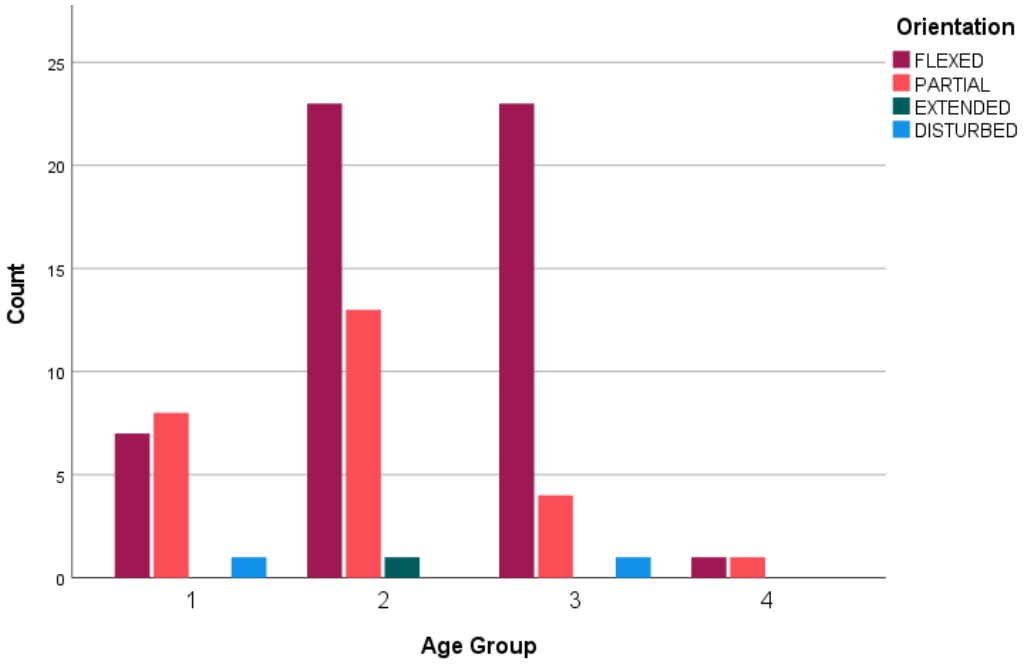


Figure 10. Cases of burial orientation per age group.

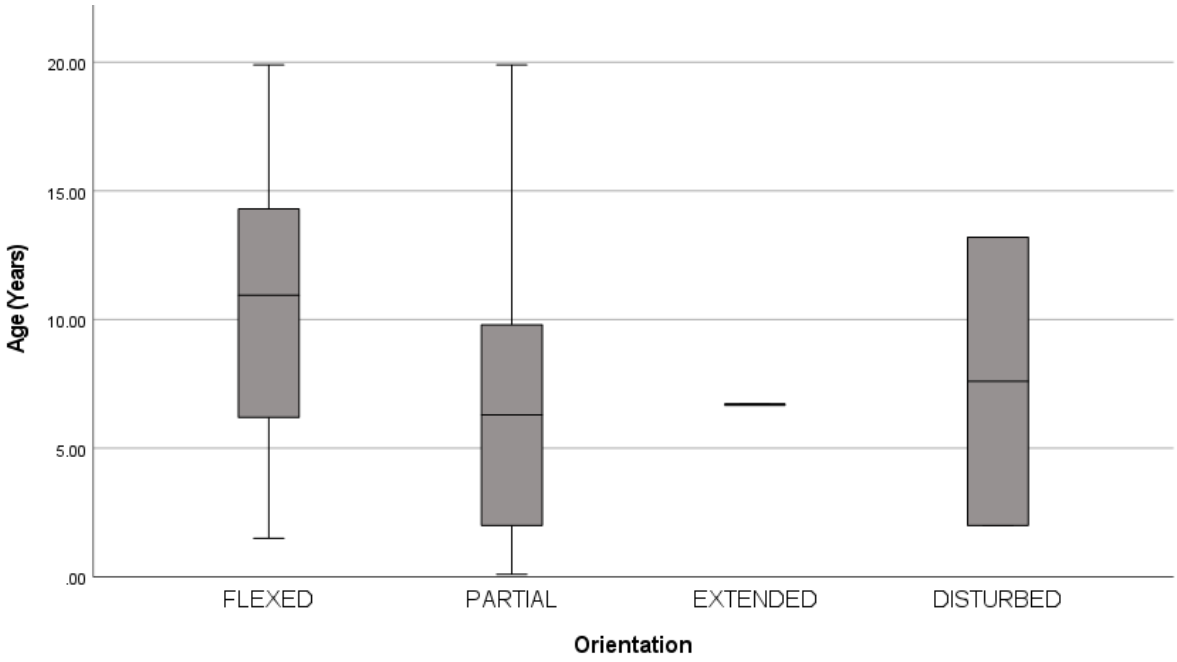


Figure 11. Frequency of burial orientation across average ages.

Grave Goods

Grave good assessment was based on the patterned presence and absence of different types of grave good types. Figures 12 and 13 show the total distribution of grave goods across the sample group. Overall, more burials contained no grave goods than those with grave goods present. Age Groups 2 and 3 contained the most cases of grave goods, with only a few individuals in Groups 1 and 4 possessing goods. Frequency trends between grave goods shows that the mean age of burials with grave goods equals about 11 years, with quartiles resting at about 6 and 14 years. Burials without grave goods demonstrate frequencies at younger ages, such as a mean average age around 7 years and a lower quartile range at 5 years. Upper quartile ranges for these burials lie just below the upper quartiles for burials with grave goods.

Observations of specific grave good types demonstrated highly variable rates of grave good inclusion in preadult burial contexts. For the sample population, there were no cases of textile, metal, or mineral-based implements. The most common grave good type were beads, which were constructed out of various animal and stone materials such as several regional shellfish species, animal bone, and cannel coal (Claassen 2019; Marquardt and Watson 2005). The final distribution of beads (Figure 14) was 29 burials with beads and 59 without. The age group with the most cases of beads is Group 3 (N = 11), followed by Group 2 (N = 10). Both individuals in Group 4, however, had beads present in the burial context. The average for burials with beads was 9.9 years, while burials without beads had an average age around 8.7 years. Animal implements comprised the second most frequent grave good type (Figure 15). Total distribution

ended with 22 burials with animal implements present and 61 burials without implements. Most animal implements were found in Group 2 (N = 10). Mean average age for burials with animal implements equaled about 9.9 years, with 8.9 for the mean average age for burials without implements. Stone implements and red ochre were the most infrequent grave goods present in the preadult sample. Stone implements (Figure 16) were found in only 9 burials out of 83 with only one case in Group 1 and the remaining cases split between Groups 2 and 3. Mean average age for stone implements is 10.6 years. The one individual in Group 1 with stone implements present was aged to about 3 years. Only two burials possessed elements of red ochre: one case in Group 1 with the individual aging around 0.10 years, and the second in Group 3 at an average age of 16 years (Figure 17).

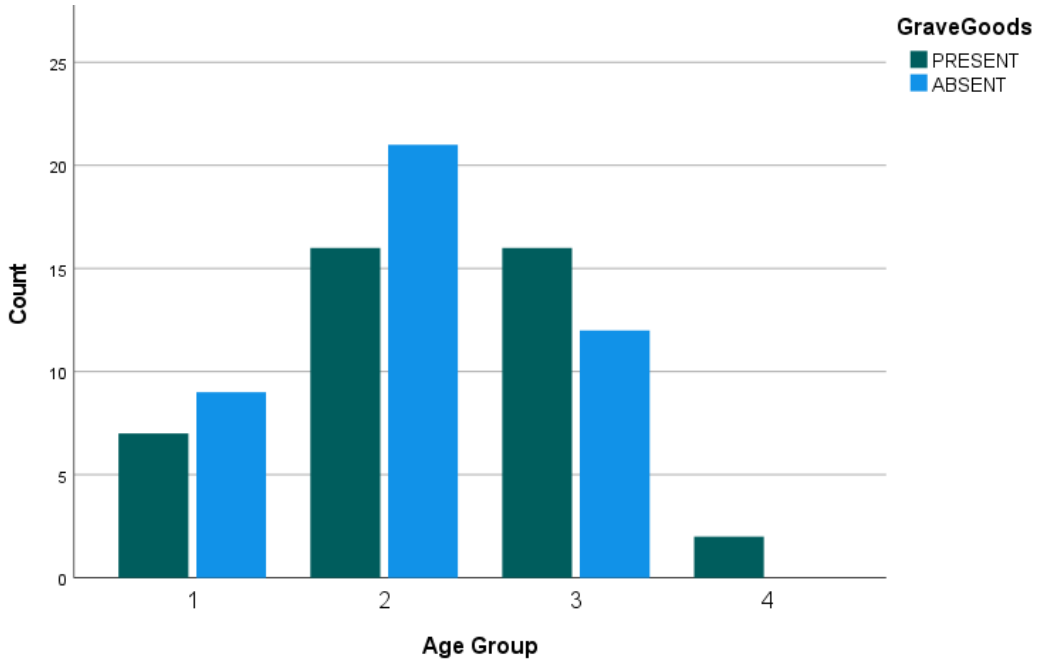


Figure 12. Total number of grave goods per age group.

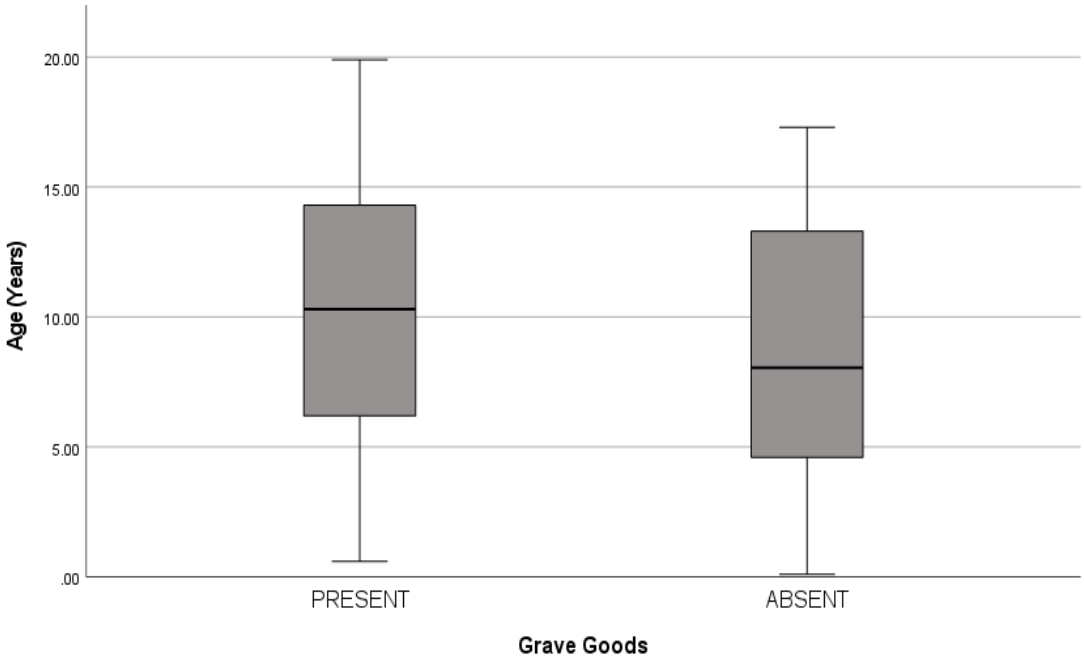


Figure 13. Distribution of grave goods across average ages.

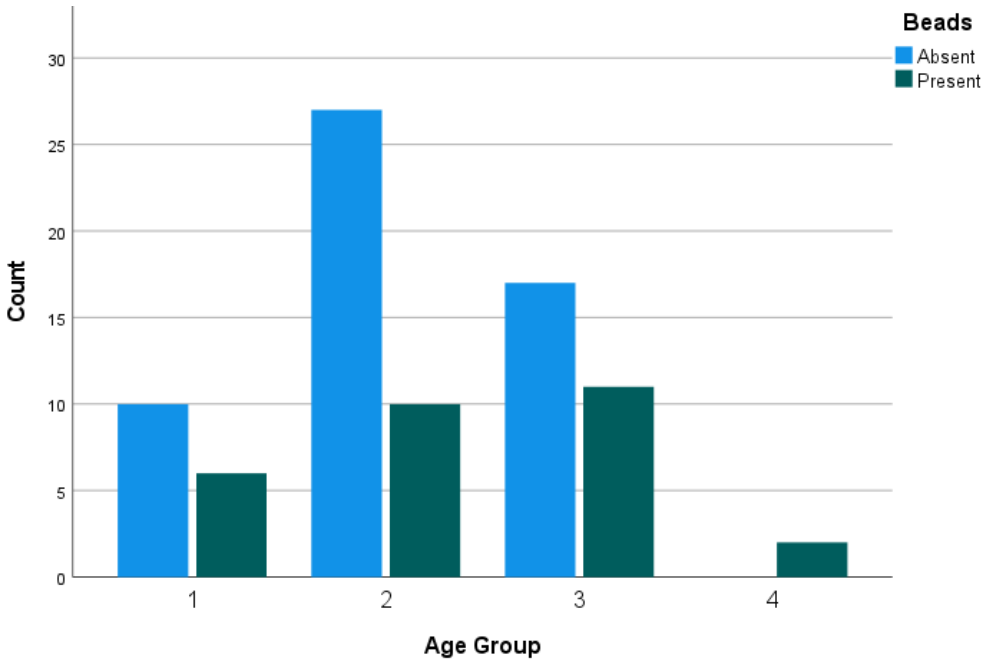


Figure 14. Distribution of beads per age group.

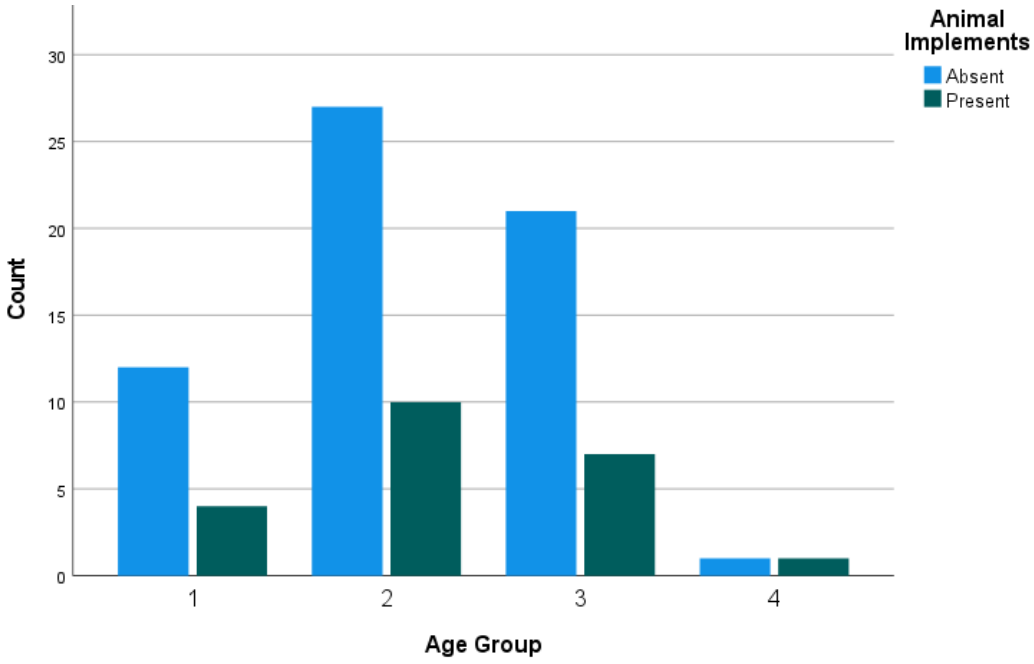


Figure 15. Distribution of animal implements per age group.

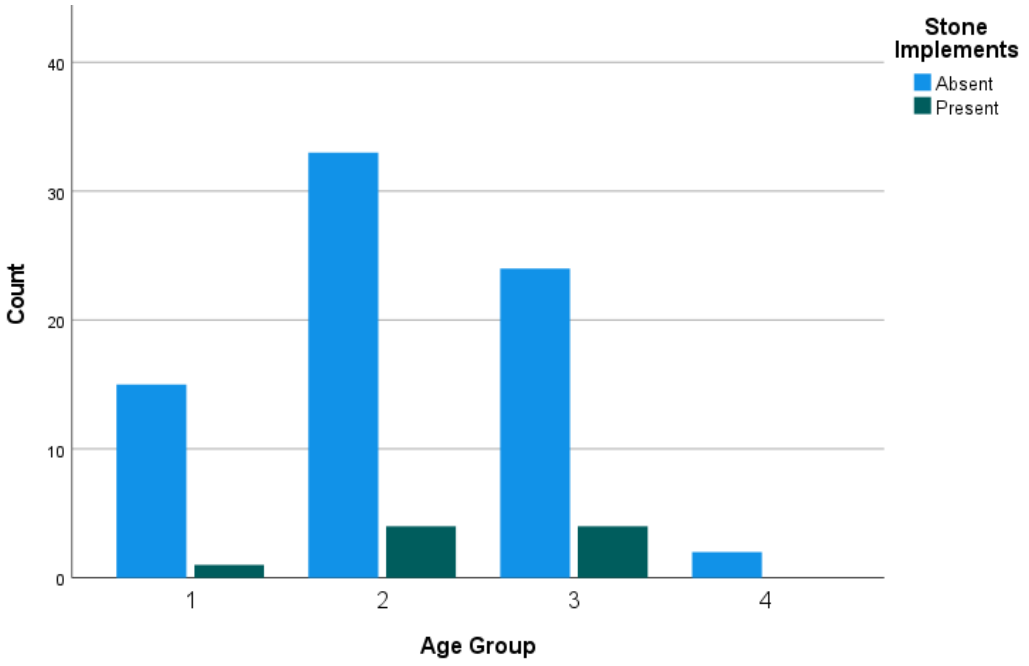


Figure 16. Distribution of stone implements per age group.

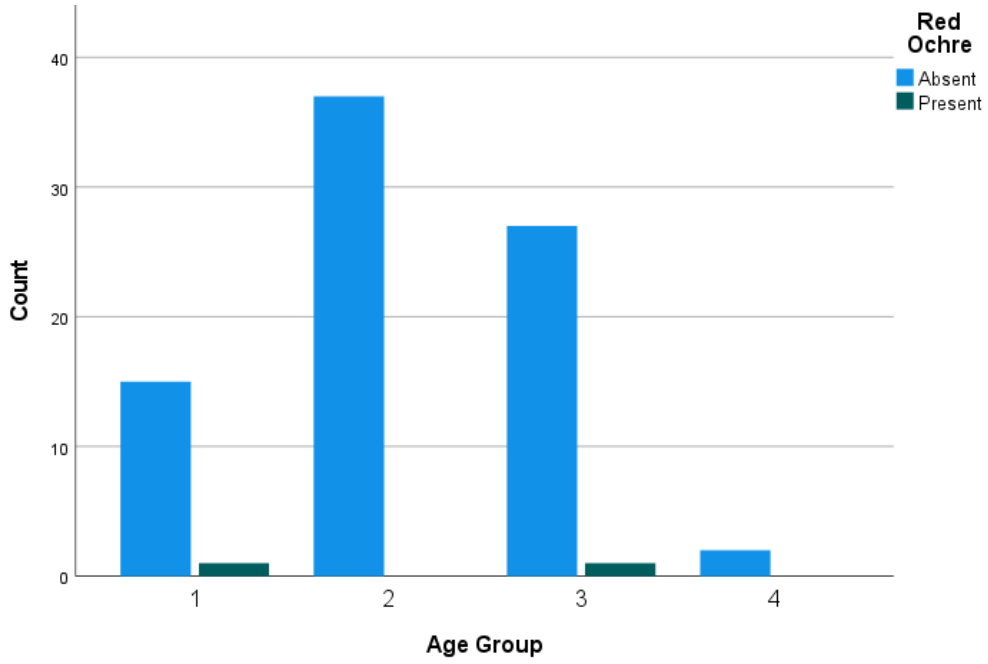


Figure 17. Distribution of red ochre per age group.

Mortuary Analysis by Dental Milestone

Organization of the preadult sample according to either crown completion (Figure 18) or root completion (Figure 19) demonstrates varied trends of burial form and grave good inclusion. Observations of crown completion establishes a gradual increase in biological matured individuals throughout the sample population as crown formation for both second and third permanent molars are completed (N = 16 for second molars; N = 25 for third molars). Conversely, observations of root completion showed many individuals possessing completed first and second permanent molars (N = 20 for first molars; N = 22 for second molars), which coincide with high retention of completed deciduous second molars (N = 24).

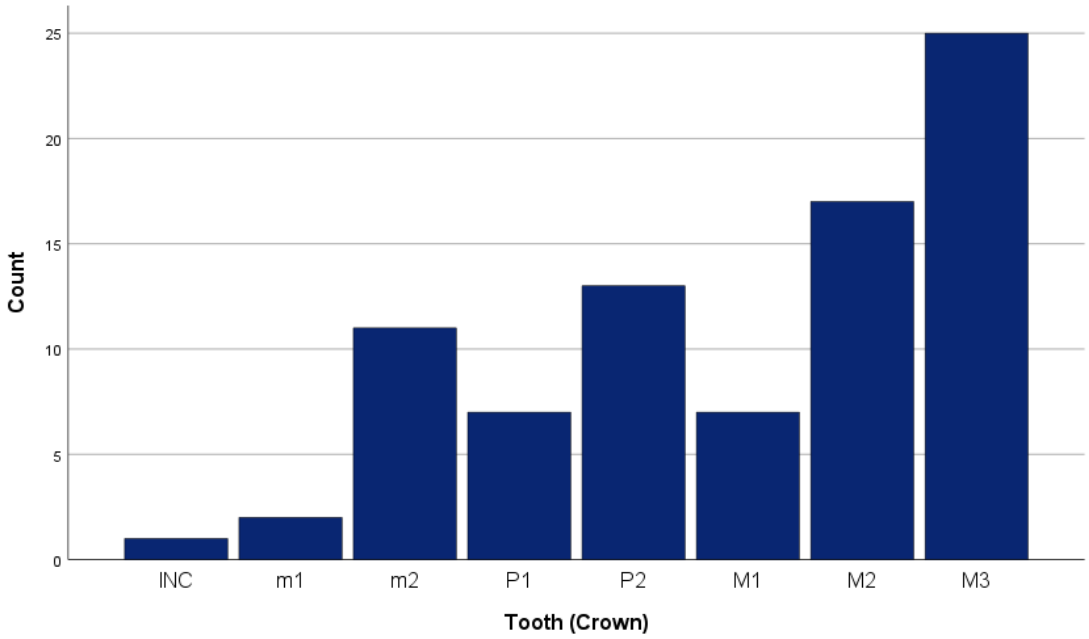


Figure 18. Total number of individuals according to last completed crown.

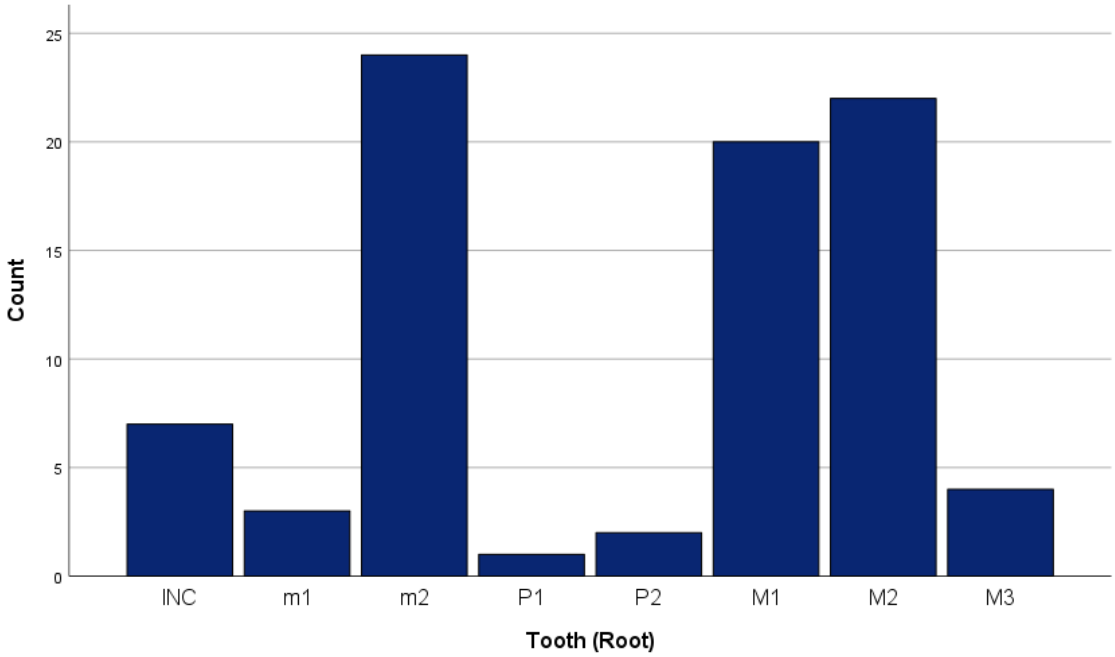


Figure 19. Total number of individuals according to last completed root.

Analysis of burial forms yielded the same frequencies as previous examinations, in which the most frequent burial form is supine-flexed. However, distribution of burial positioning (Figures 20 and 21) and orientations (Figures 22 and 23) varies according to observations of crown-root formation. Crown formation demonstrates fluctuating patterns of burial positioning following completion of the second deciduous molar, which exhibited high rates of supine positioning (N = 7). Right-side positioning remains the preferred burial form until a shift towards supine positioning after the completion of the third permanent molar (N = 9). Conversely, comparison of burial positioning to root formation shows varied rates of positioning following completion of the second deciduous molar (N = 126), in which total cases of supine positioning drops significantly. In contrast to burial positioning, patterns of burial orientation show similar patterns, in which frequency of flexed orientation increases with the completion of crow-root formation through the dental arcade. Partially-flexed orientation remains the second most frequent orientation across the preadult sample for both crown and root development. Instances of varied burial orientation are seen in the second deciduous and permanent molar, where cases of extended orientation switch between the two teeth depending on crown formation (M2) and root formation (m2).

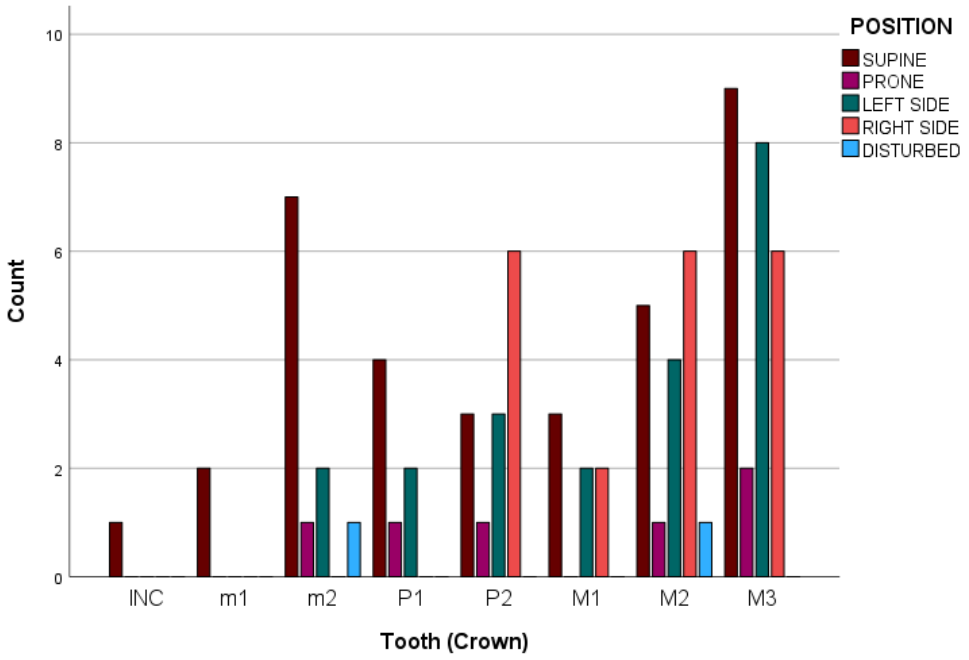


Figure 20. Burial positioning according to crown development.

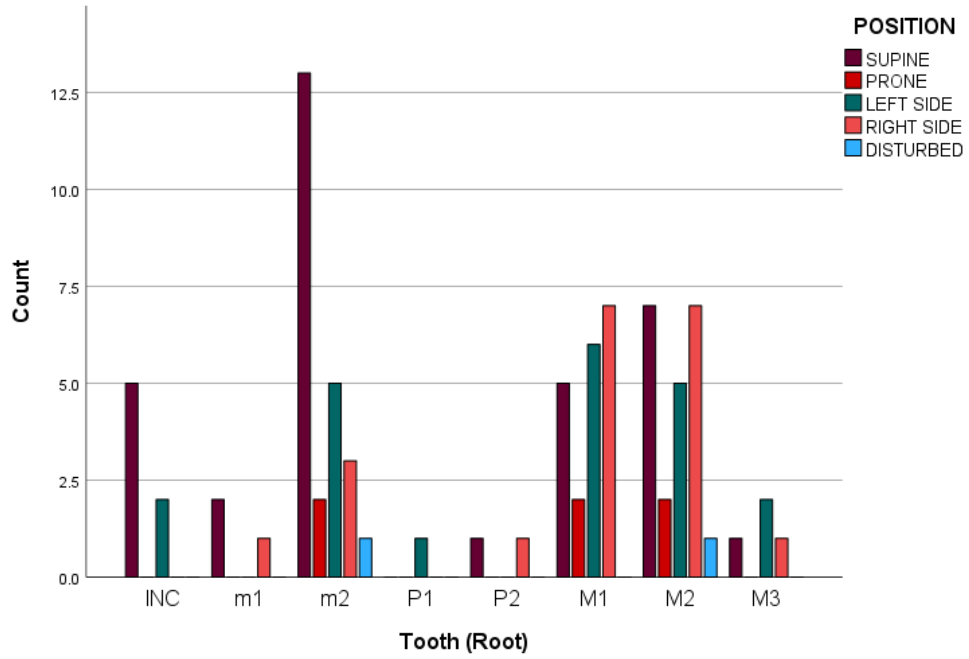


Figure 21. Burial position according to root development.

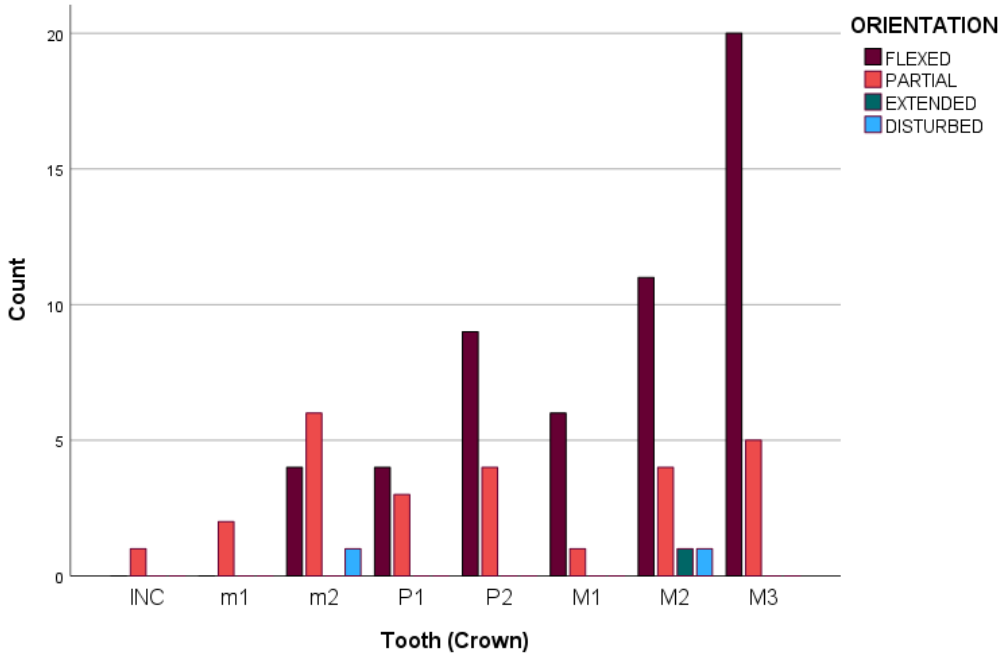


Figure 22. Burial orientation according to crown development.

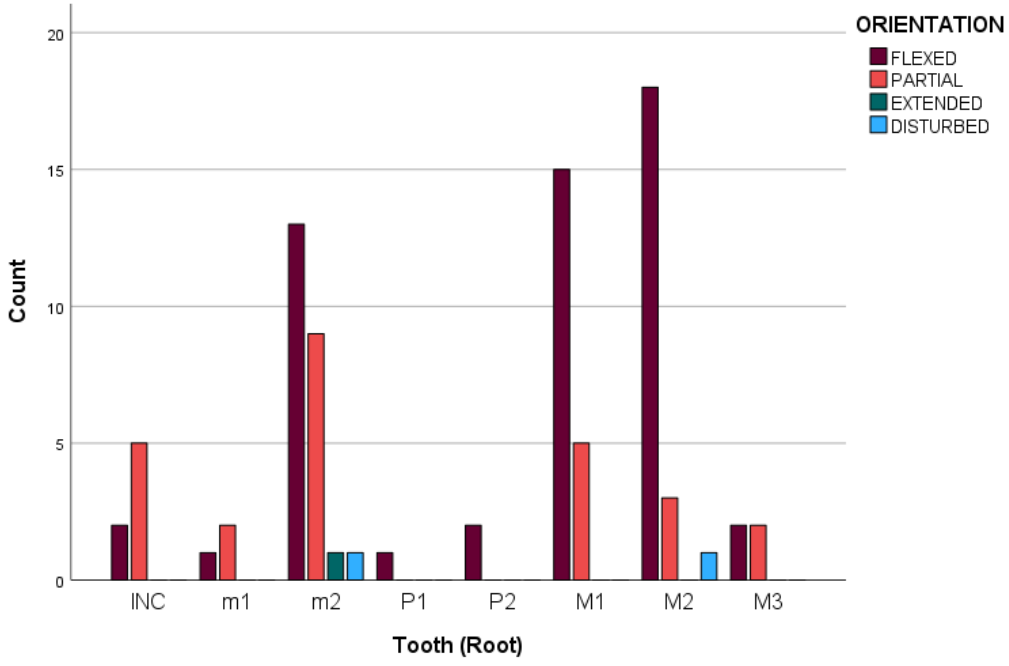


Figure 23. Burial orientation according to root development.

The total distribution of graves goods was about equal between burials without grave goods (N = 42) and with grave goods (N = 41). Grave good comparisons (Figures 24 and 25) demonstrate similar burial patterns established in the previous analyses of the sample population using dental milestones. For crown formation, grave good presence increases over the course of biological maturation with most grave goods present after the completion of the third molar crown (N = 16). While majority of grave goods were seen with individuals possessing completed permanent roots (N = 10 for M1; N = 14 for M2), frequent inclusion of grave goods is seen for individuals with completed deciduous molars (n = 10 for m2). Similar trends are seen in the placement of beads (Figures 26 and 27) and animal implements (Figures 28 and 29) for both crown-root comparisons. Stone implements (Figures 30 and 31), however, are equally distributed with select preadults displaying completed deciduous roots (N = 3 for m2) as well as those with completed M1 and M2 roots (N = 3).

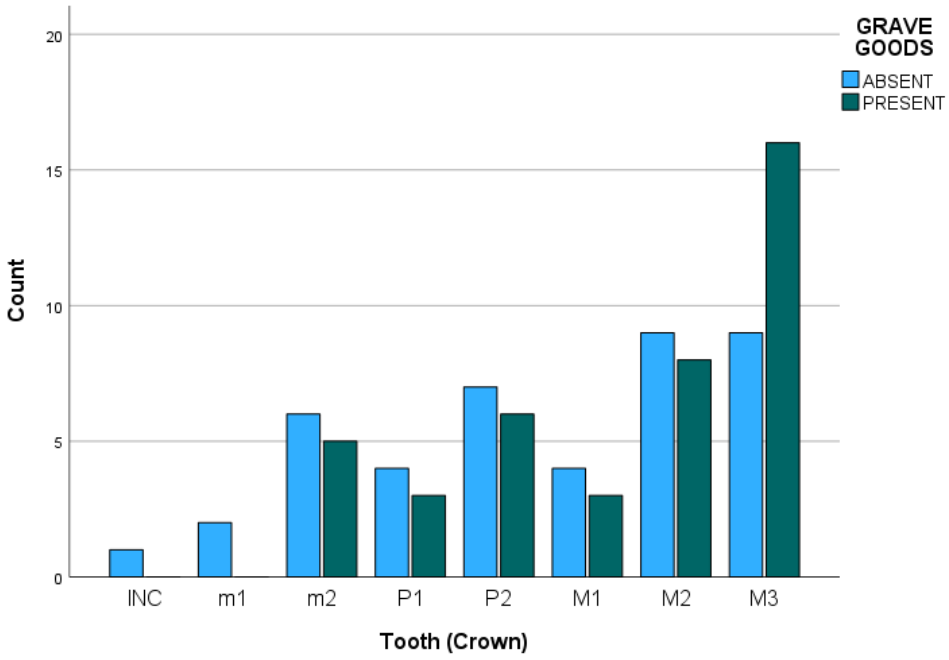


Figure 24. Total grave goods based on crown completion.

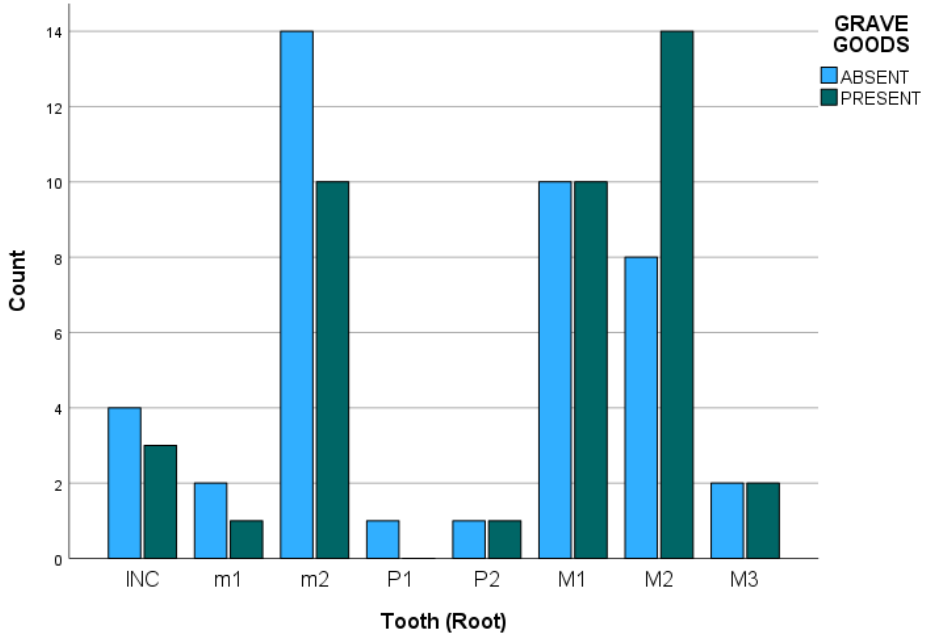


Figure 25. Total grave goods based on root completion.

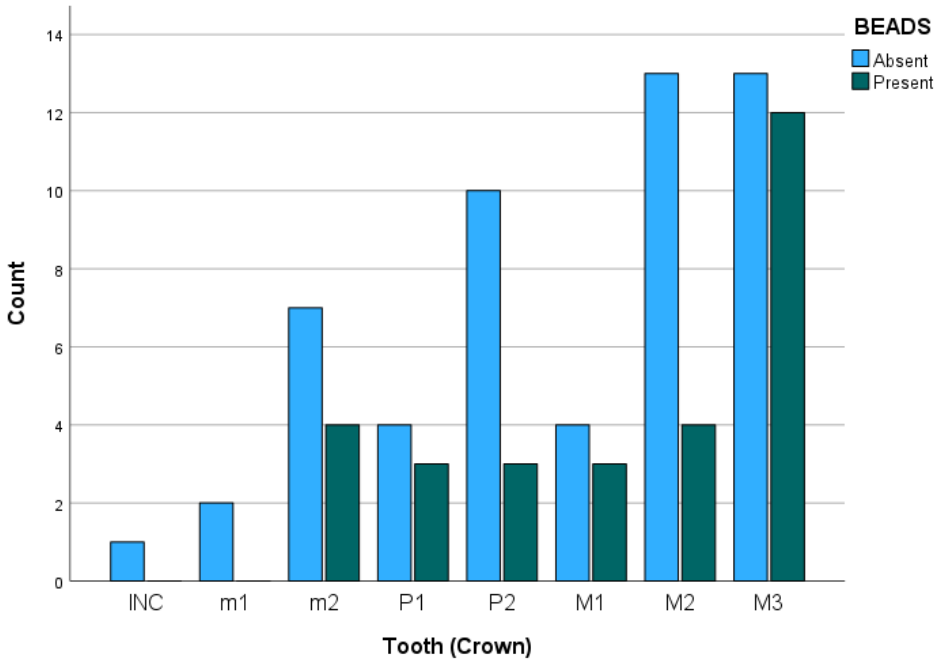


Figure 26. Distribution of beads per crown completion.

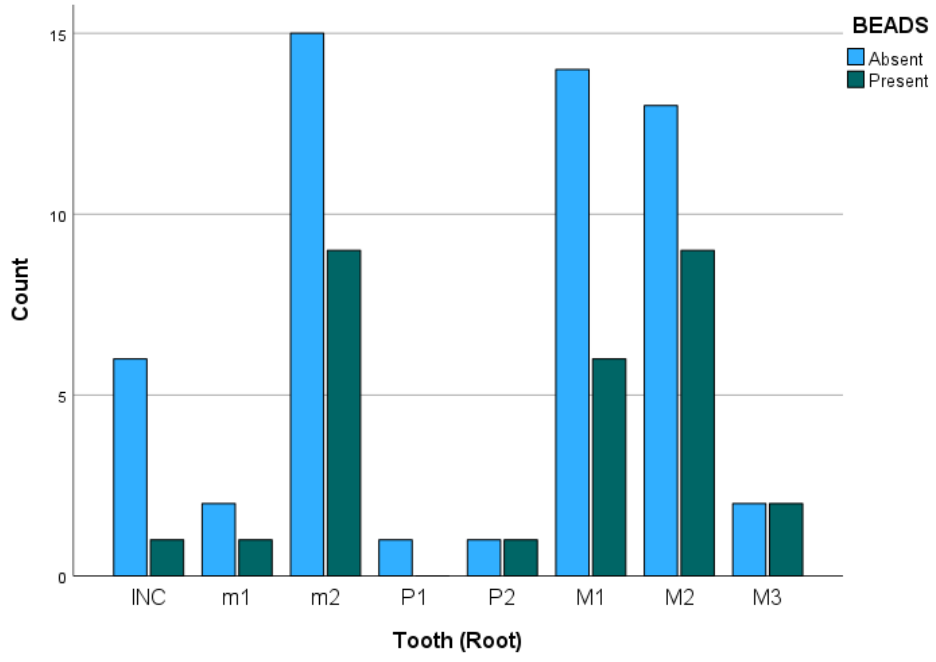


Figure 27. Distribution of beads per root completion

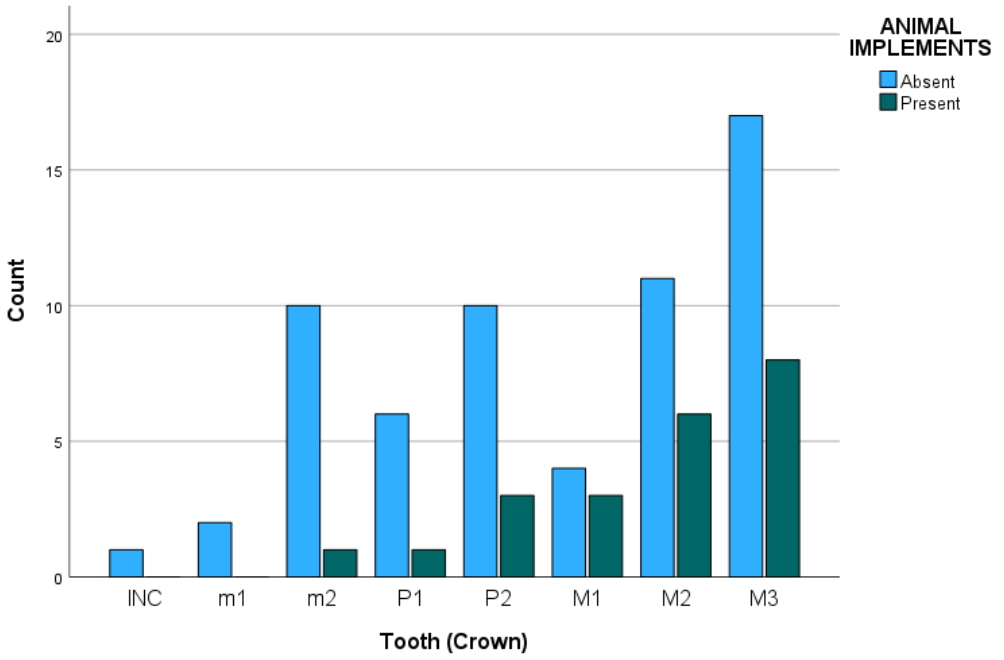


Figure 28. Distribution of animal implements per crown completion.

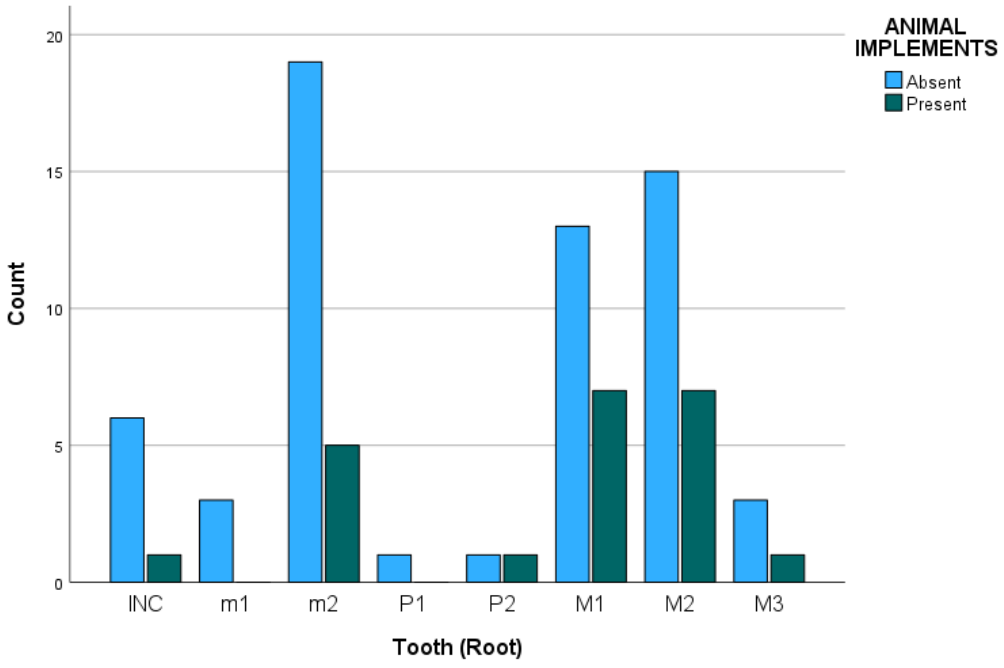


Figure 29. Distribution of animal implements per root completion.

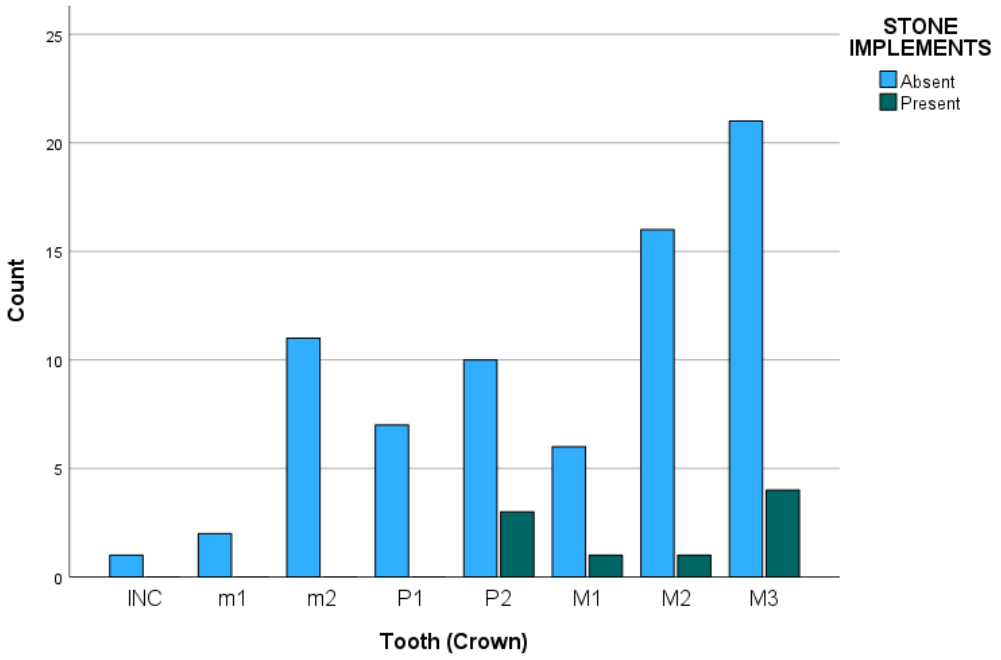


Figure 30. Distribution of stone implements per crown completion.

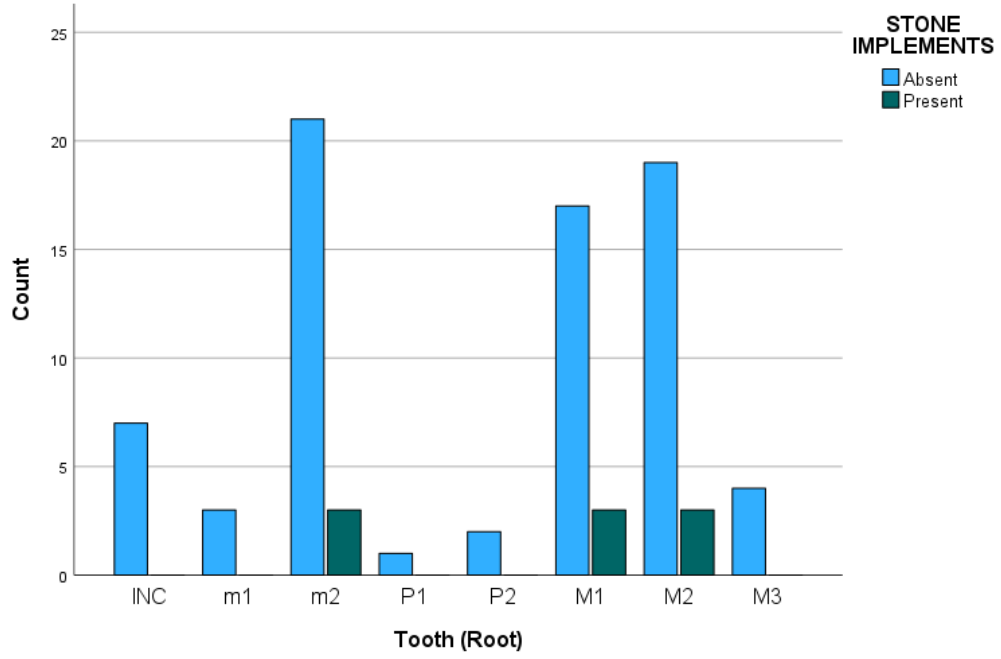


Figure 31. Distribution of stone implements per root completion.

Indian Knoll Mortuary Analysis

Demographics and Burial Placement

Demographic assessment of interments at Indian Knoll encompassed all five age categories; the burial landscape thus consists of individuals during all stages of biological and social maturation. Figures 32 and 33 demonstrate the total number of individuals per age group and the distribution of average ages across the site's burial population. Most individuals age into Group 4 (N = 408), with a mean average age of 24.3 years. The second largest age category is Group 1 (N = 258) at a mean average age of 0.99 years. Group 5 had the least number of individuals (N = 43) at a mean average age of 42.2 years. The remaining individuals are divided between Group 2 (N = 69) and Group 3 (N = 63). Due to the high count of individuals in Groups 4 and 1, age frequencies favored lower ages. Mean age for the site population is 16 years, with percentile values at 2, 21, and 24 years. Two burials from Group 5, Burials 532 and 530, both age to about 60 years and are considered the upper extremes of the population age dynamic. It is important to note that possible explanations for skewness in population ages could be resultant from variable rates of disturbed burials throughout the different age groups (N = 82). Several individuals from Group 4 were also recorded as having different estimated ages between site reports and were recorded at an average of 35 years for this research; therefore, some individuals may be misrepresented in the site record due to misidentified remains.

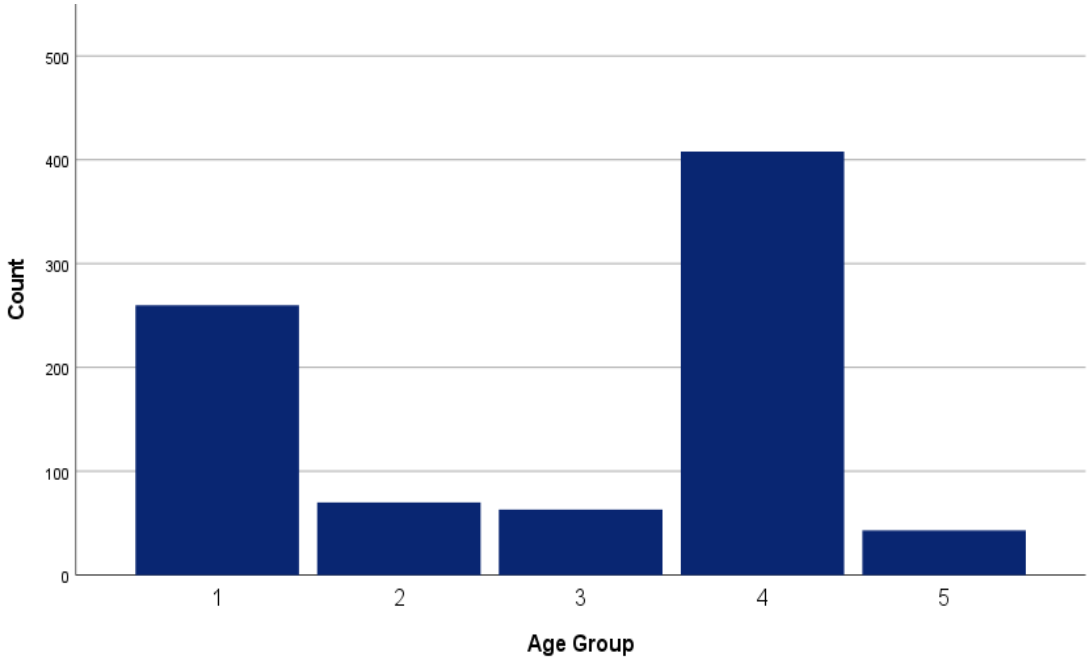


Figure 32. Total number of burials per age group.

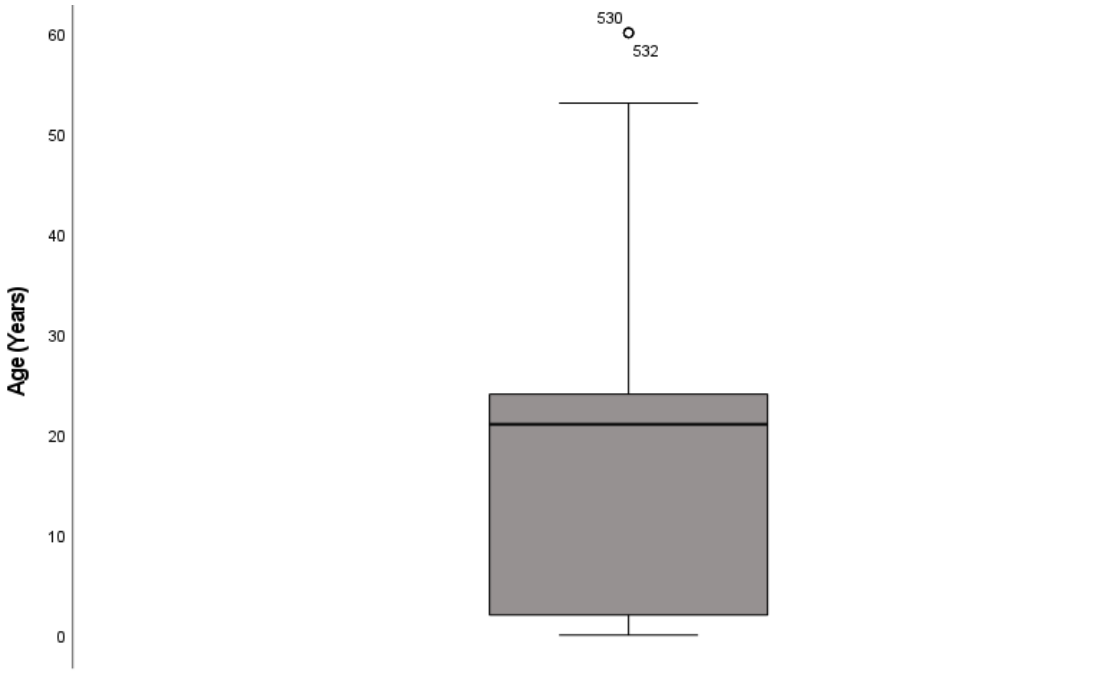


Figure 33. Age distribution across Indian Knoll mortuary population.

Comparisons of site-wide burial positioning and orientation shows a distribution of cases that correlate with the number of individuals per age group. However, comparisons between site burial forms and those observed in the preadult sample show variations across age groups. Burial positions, shown in Figures 34 and 35, follow the same order of prevalence as in the preadult sample, with the supine as the primary form (N = 266, $\bar{x}$= 13.8 years). Conversely, while right-side formed the second most frequent position (N = 229), Group 4 individuals demonstrated an almost equal pattern between right-side and supine positioning ($\bar{x}$ = 19.3 years). Left-side positioning was the third most common form and was most observed in Groups 2 and 3 (N = 208, $\bar{x}$= 17.4). Another difference between the sample and site burial patterns is that four individuals displayed a seated position: three cases were in Group 4 and one in Group 1 ($\bar{x}$ = 21.2 years).

Burial orientations (Figures 36 and 37), again, shows the same frequencies across age groups as in the sample population: flexed (N = 511), partially-flexed (N = 238), and extended (N = 9). Frequency of orientation forms shows a difference between Group 1 and the remaining age groups. Group 1 shows the most cases of partially-flexed individuals; however, the ratio of partially-flexed ($\bar{x}$ = 10.2 years) to flexed individuals decreases as the age ranges increase. Group 4 demonstrates the most cases of flexed orientations ($\bar{x}$ = 19.7 years). The only instances of extended orientations are also found in Group 4 with one outlying case in Group 2 (N = 9; $\bar{x}$ = 21 years). Comparisons of position-orientation pairs thus show distinct forms depending on the frequency of burial positions. In order, the most common burial forms are flexed-right side (N = 173, $\bar{x}$=

21.4 years), flexed-left side (N = 153, $\bar{X}$ = 20.1 years), flexed-supine (N = 144, $\bar{x}$= 16.8 years), and partially flexed-supine (N = 113, $\bar{x}$ = 9.4 years).

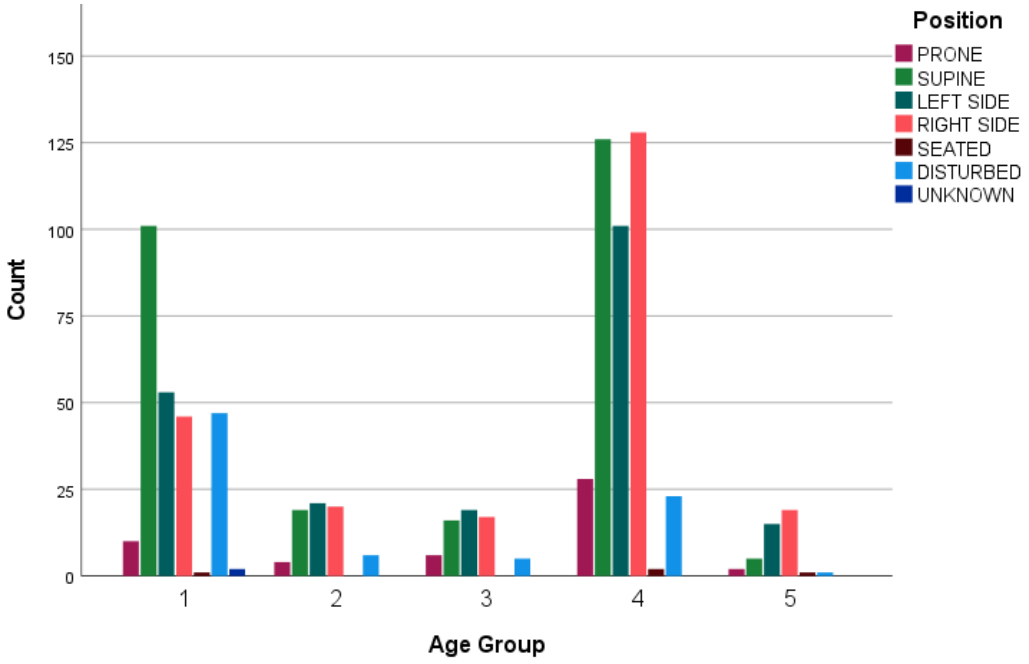


Figure 34. Cases of burial position per age group.

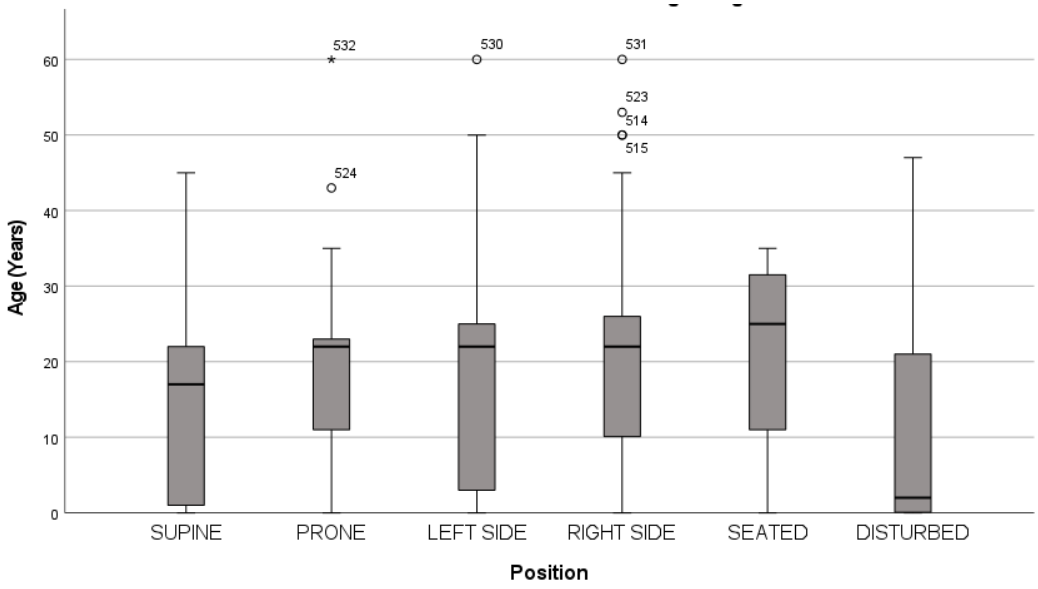


Figure 35. Frequency of burial position across average ages.

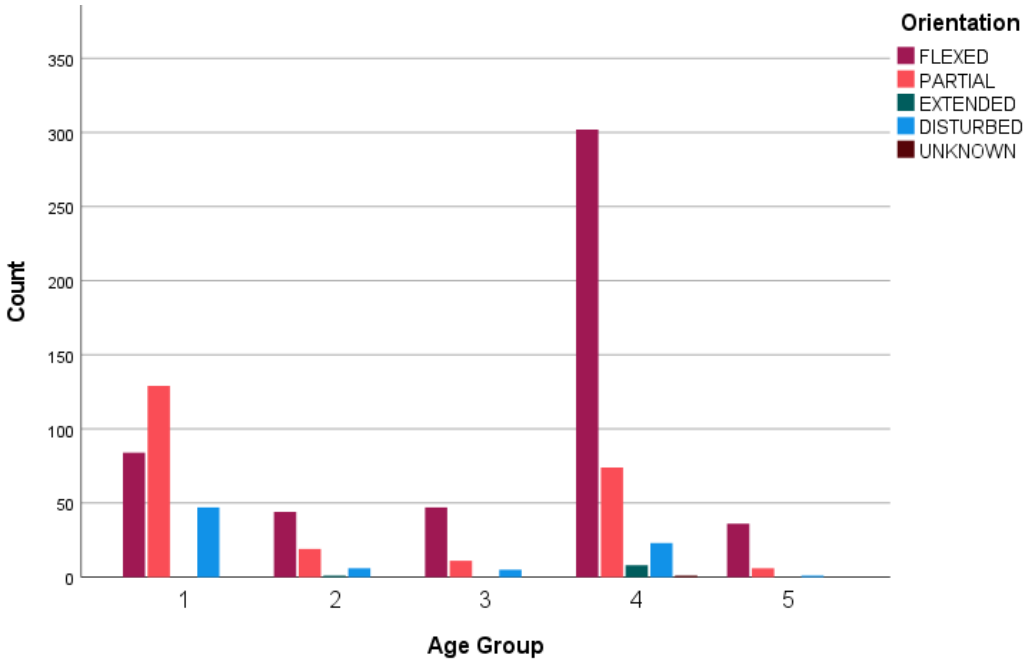


Figure 36. Cases of burial orientation per age group.

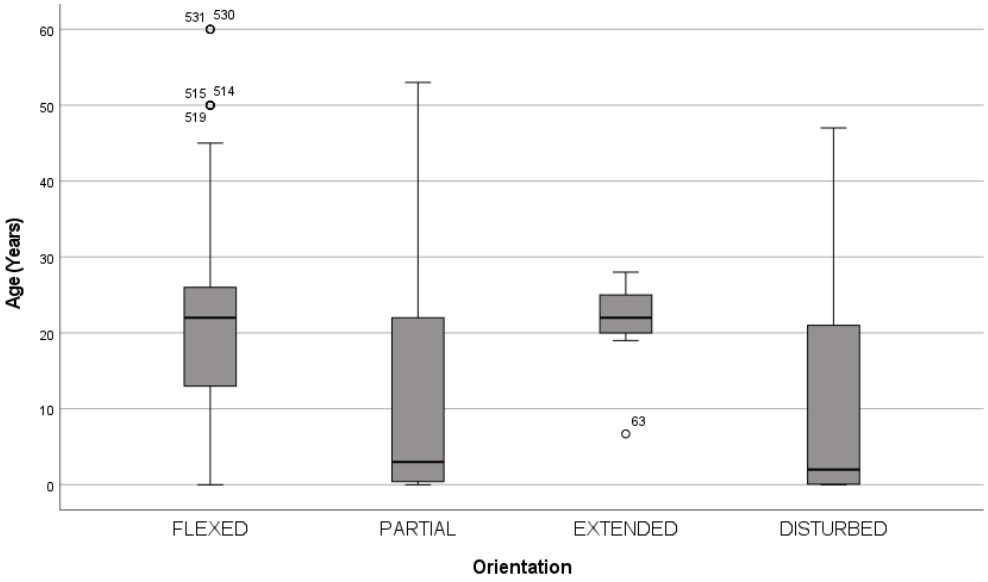


Figure 37. Frequency of burial orientation across average ages.

Multiple Interments

While frequency of multiple interments was recorded for both data sets, site-wide analysis provided a broader scope than the preadult sample to maturity-based associations between individuals interred in the same burial contexts. In total, 62 cases of multiple interments were listed for Indian Knoll. Figure 38 demonstrates the number of individuals per case, in which each dot graphed represent a single individual within each context plotted against average age estimations. Interment groups with only one dot present had multiple individuals estimated at the same average age. The box plots demonstrate frequency of ages between individuals. In many cases, burial groups only contain 2-3 individuals. Only three cases listed had over four individuals: Group 20, Group 27, and Group 45. Estimated ages for these interment groups extended across

several age groups; most frequent distribution found between Age Groups 1, 2, and 4. Interment groups with similarly aged individuals were found in all age groups, but mostly observed in Age Groups 4 (18-35 years) and 5 (35-50+ years). The most frequent associations in Indian Knoll multiple interments consist of individuals in Age Groups 1 (0-3 years) and Group 4 (18-35 years). For these groups, if there are three to four individuals, age distribution shows that 4-1 associations are typically accompanied by individuals whose average age falls around the median of the group's age distribution. Examples of this are seen in Interment Groups 15, 23, and 46.

Two interments groups, Groups 14 and 25, were reported by Webb (1974) and Marquardt and Watson (2005) as displaying specific relational placement of interments. Here, the younger individual, aged as newborns, were placed within the pelvic cavities of the older individuals; this exact placement inferring a mother-offspring relationship. However, in many cases, multiple interments were recorded as disarticulated or having missing skeletal elements, such as leg bones and skulls, or recorded as an "intruded" burial (Marquardt and Watson 2005; Webb 1974). Therefore, some multiple interments could be unassociated individuals interred at separate times during Indian Knoll's occupation. All interment groups also displayed fluctuating rates of grave good presence and absence, in which some artifacts could not be correlated to one specific individual or individuals.

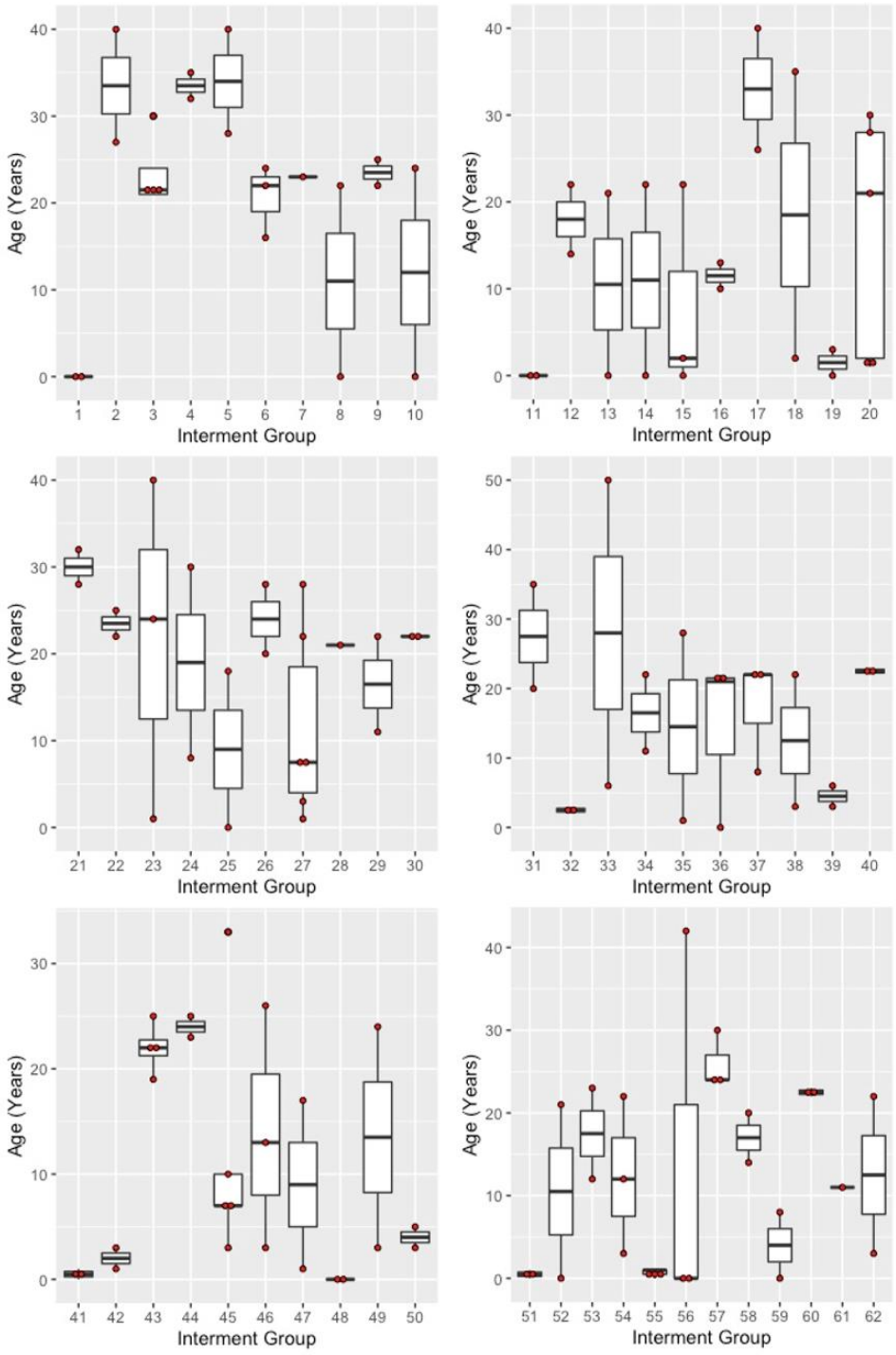


Figure 38. Box-dot diagram of multiple interment burials.

Grave Goods

Analysis of grave good assemblages in the Indian Knoll mortuary landscape (Figure 39) show that, like the preadult sample, a greater number of burials possessed no grave goods. However, grave good preservation, excavation methods, and rate of disturbed burials must be considered when comparing the rate of grave good presence and absence. As such, cases of textile, metal, and mineral-based grave goods were too few to properly graph. Specific grave good analysis, therefore, consisted of beads, red ochre, animal implements, and stone implements. In total, 288 burials out of 841 (Table 6) had grave goods at a mean average age of 14.4 years. Burials without grave goods had a mean average age of 16.8 years. Age groups with the most grave goods present were Groups 1 and 4. Groups 2 and 3 were almost equally split between grave good presence and absence, while Group 5 demonstrated the lowest rate of grave good presence.

Table 6. Summary statistics of grave goods at Indian Knoll.

Age

Grave Goods	Mean	N	Std. Deviation	Std. Error of Mean	Maximum	Minimum
ABSENT	16.82	553	12.656	.538	60	0
PRESENT	14.49	288	11.786	.694	53	0
Total	16.03	841	12.407	.428	60	0

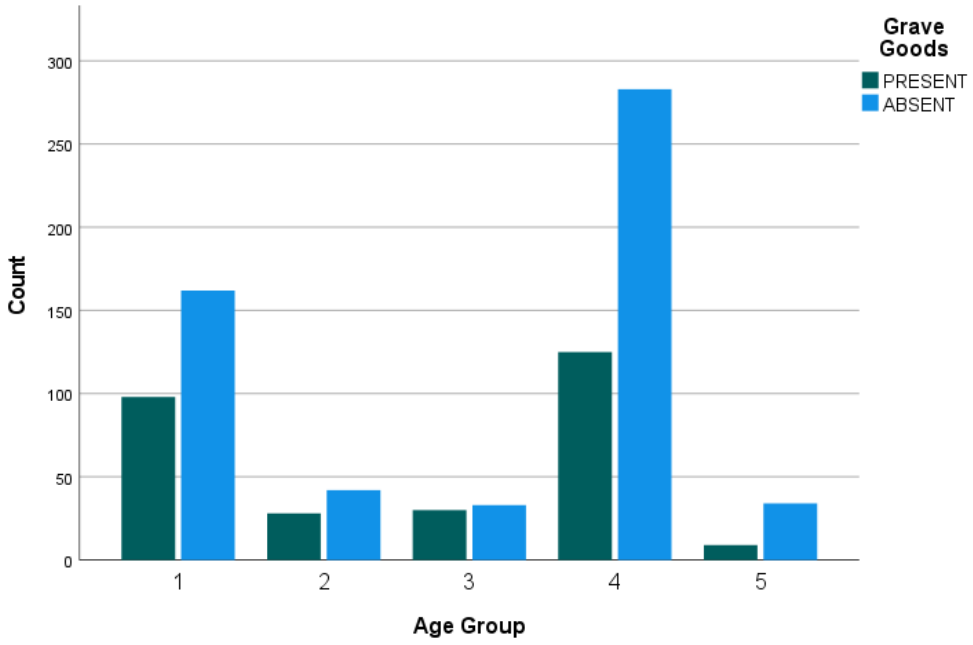


Figure 39. Distribution of grave goods per age group.

The most common type of grave goods found at Indian Knoll are beads and animal implements. In total, 162 burial contexts possessed beads (Figure 40) at a mean average age of 13.1 years. Burials without beads had a mean average age of 16.7 years (N = 679). Beads were found most frequently in Age Group 1 and 4, which had an almost equal number of bead-present contexts. The lowest rate of beads was recorded in Group 5. Animal implements demonstrated similar trends across age groups (Figure 41). 148 burials out of 841 yielded animal implements, with an average of 15.5 years. While Groups 1 and 4 demonstrated the highest rates of animal implements, Group 4 had about a third more instances of animal implements than Group 1. Group 5 continued to show the lowest frequency of grave goods. Likewise, traces of red ochre followed the same

trends established by other grave goods despite its low presence in Indian Knoll burials (Figure 42). Only 30 burials had red ochre present ($\bar{x}$ = 10.4 years), with most cases found in Group 1. Group 4 had the second most cases of rec ochre, while few cases were observed in Groups 2, 3, and 5.

The final grave good type, stone implements, was the third most frequent grave good type found at Indian Knoll (Figure 43). Final burial count with stone implements was 80 out of 841 with a mean average age of 17.1 years. Burials without stone implements equaled 761 at a mean average age of 15.9 years. Group 4 demonstrated the highest frequency of stone implements, followed by Group 1. While presence is relatively low within the Indian Knoll mortuary landscape, frequent presence of stone implements with other grave good types was noted during initial recording of burial data. Specifically, atlatl stone implements were noted to appear in juxtaposition to specific animal implements. The most recurrent materials listed with atlatl elements included bone or antler-made fishhooks, pendants, gravers, and other atlatl sections. Bone or shell beads and fragmented animal remains were also found in several of these contexts as well. Two-tailed correlation tests were made to test if grave good type associations were significant (Table 7), particularly observing frequency of stone implements in relation to beads, animal implements, red ochre, textiles, and metal/mineral grave goods (p = 0.01). Correlation statistics suggests a significant association between stone implements and animal implements (r = 0.381, p = <0.001) as well as beads (r = 0.163, p = <0.001). Animal implements also demonstrated a significant correlation to beads separate from association with stone implements (r = 0.297, p = <0.001). A significant correlation was

also present between animal implements and mineral/metal grave goods (r = 0.150, p = <0.001); however, total number of mineral/metal grave goods found in Indian Knoll was not significant enough for graphing comparisons.

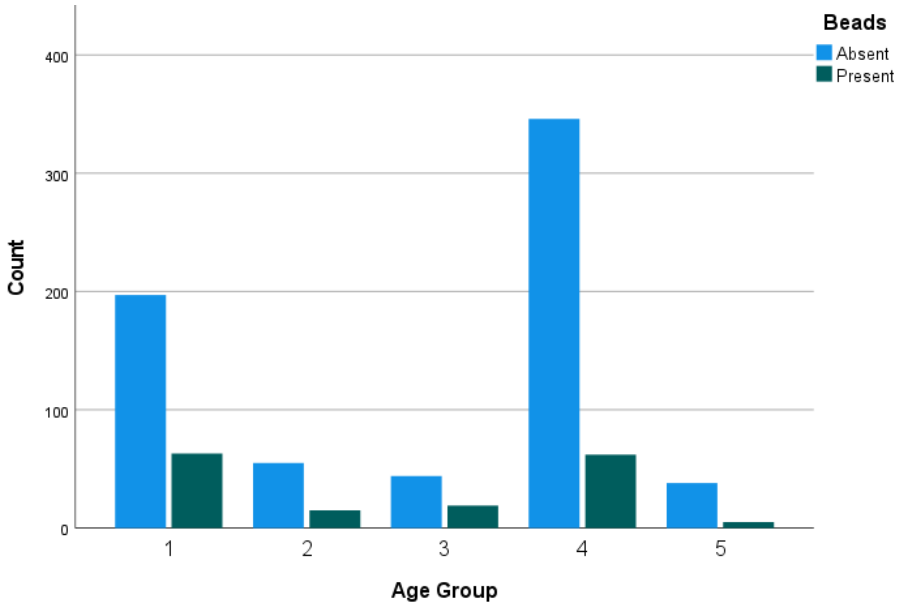


Figure 40. Distribution of beads across site.

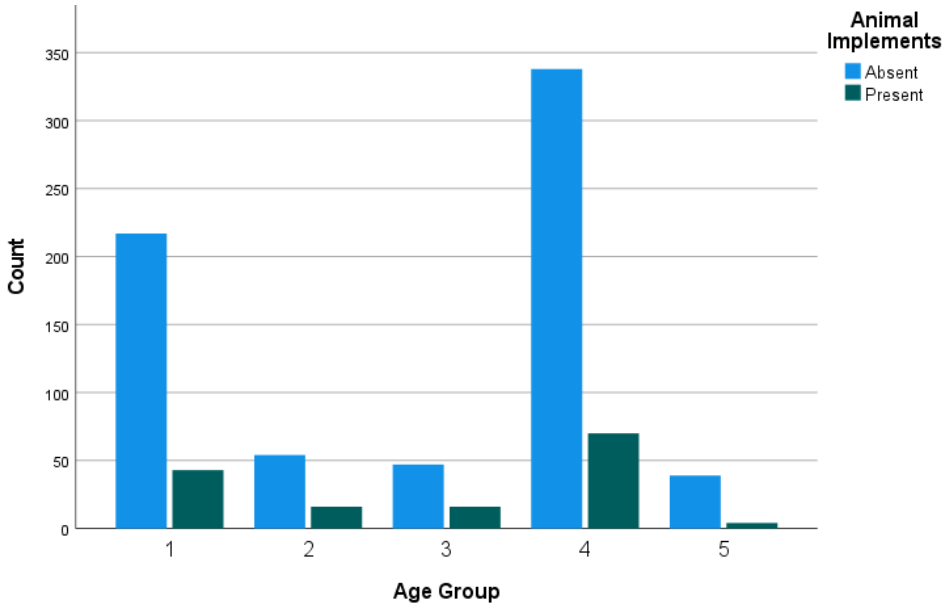


Figure 41. Distribution of animal implements across site.

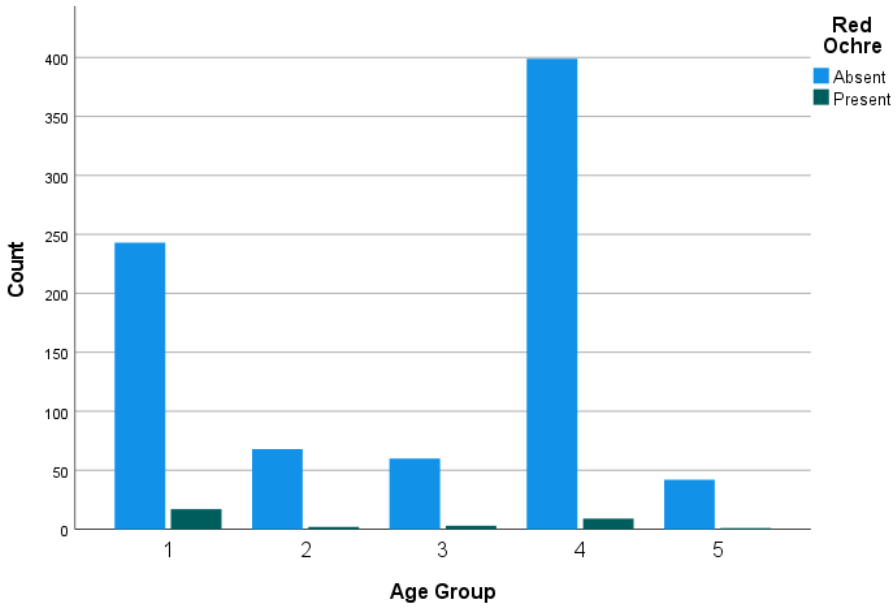


Figure 42. Distribution of red ochre across site.

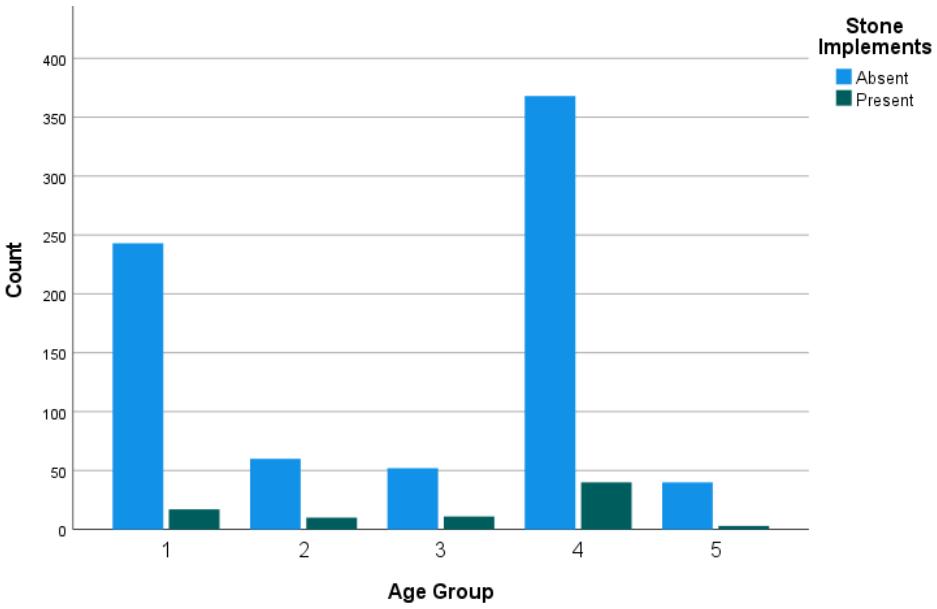


Figure 43. Distribution of stone implements across site.

Table 7. Correlation test between grave good types.

Correlations

		Stone	Animal	Beads	Red Ochre	Textile	Mineral/Metal
Stone	Pearson Correlation	1	.381**	.163**	.061	.047	.075*
	Sig. (2-tailed)		<.001	<.001	.078	.174	.029
	N	846	846	846	846	846	846
Animal	Pearson Correlation	.381**	1	.297**	.103**	.078*	.150**
	Sig. (2-tailed)	<.001		<.001	.003	.023	<.001
	N	846	846	846	846	846	846
Beads	Pearson Correlation	.163**	.297**	1	.060	.025	.085*
	Sig. (2-tailed)	<.001	<.001		.084	.472	.014
	N	846	846	846	846	846	846
Red Ochre	Pearson Correlation	.061	.103**	.060	1	.020	.036
	Sig. (2-tailed)	.078	.003	.084		.555	.300
	N	846	846	846	846	846	846
Textile	Pearson Correlation	.047	.078*	.025	.020	1	-.015
	Sig. (2-tailed)	.174	.023	.472	.555		.670
	N	846	846	846	846	846	846
Mineral/Metal	Pearson Correlation	.075*	.150**	.085*	.036	-.015	1
	Sig. (2-tailed)	.029	<.001	.014	.300	.670	
	N	846	846	846	846	846	846

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

CHAPTER 5: DISCUSSION

The comparison of mortuary practices between the preadult sample and the burial record for Indian Knoll demonstrates the partiality of sample-based analysis in bioarchaeological studies, as the demographical representation in the sample may not reflect the living population. Preadults, specifically, offer complex insight to the biosocial experiences presented in the osteological and pathological makeup of human remains of a given society. Concepts of heterogenous frailty and selective mortality have proposed that age-based studies should consider individuals presented in the mortuary record in terms of "survivor" and "non-survivor," or that osteological evidence may be inconsistent across the studied population and may not reflect patterns of health, mortality, and age-based physiological traits in individuals not present in the mortuary landscape (DeWitte and Stojanowski 2015; Sofaer 2006; Temple and Goodman 2014). Contextual approaches and intrasite comparisons of human remains, therefore, may provide better understanding of the variability between human plasticity during early life development and how preadult remains can infer variability in life experiences. Comparison to persistent mortuary practices, such as the methods used in this research, can thus demonstrate how variability in mortality and health intersect with sociocultural identities (Johnston 1969; Klaus 2018; Temple and Goodman 2014).

Dental Age and Preadult Maturation

Dental development in preadults has been utilized through biological anthropology as a method of age estimation. Both deciduous and permanent mandibular dentitions, while more resistant to environmental influences than other skeletal traits, are still susceptible to early life experiences, including periods of stress, health trajectories, and physiological buffering from sociocultural factors that affect observable rates of dental morphological development. However, chronological estimation of dental development, such age of attainment and age of formation, have yielded different timing of dental formation and eruption in comparison to biosocial timeframes (Halcrow et al. 2007; Liversidge et al. 2010; Smith 1991). Maturation scales, therefore, have been proposed in lieu of dental chronologies, as utilization of chronological age systems place studied peoples in uniform biological standards (Liversidge et al. 2010; Smith 1991). Even when used to establish maturation scales, considerations must be taken when using models of crown-root tooth formation, such as Moorrees et al. (1963), in age estimation methods of non-Western societies. Considerations of biases must be made when such models are used in studies of past societies, as shifting sociocultural environments and physiological buffering systems create heterogenous growth and development between both individuals and groups (Halcrow et al. 2007; Liversidge and Molleson 2004; Wolfe and Herrmann 2022).

Comparison of crown-root age estimation of Indian Knoll preadults shows that chronological estimation methods projected dental development trajectories with a difference ranging between a few months up to 2 years. The representation of maturation

ages in the preadult sample, while not projecting the same demographic trends presented in the site burial data, demonstrates the Indian Knoll preadults experienced similar trajectories of early life development, in which individuals underwent transitional phases of biosocial maturation between immature and mature biological ages. Varied rates of crown-root completion in deciduous teeth suggests heterogenous experiences in the developmental environment, which may be reflected in the high rates of mortality in Age Group 1 in the Indian Knoll burial data. Preadults that mature into Age Groups 2 and 3 thus show "stabilization" of development, shown in the low variation in permanent tooth formation, as these individuals mature past critical life stages. Individuals estimated around 5 and 8 years demonstrated a period that preadults begin to homogenize in growth following the completion, reportion, and loss of deciduous teeth. Final stages of dental maturation, or the completion of the mandibular permanent dentition, compares to the increase in matured individuals in Group 4 that comprises the main demographic of Indian Knoll; arguably the "matured" life stage.

Mortuary analysis of preadult dental milestones suggests that specific stages of biological maturation played significant roles in preadult identity in Indian Knoll mortuary practices. For both crown and root formation, development of the second deciduous molar (m2) and permanent molars consistently appear as key indicators of biosocial milestones. While total observations for crown development suggested that preadult identities were established later during biological maturation, comparison of burial forms to root development demonstrates early attainment of differential identities at the time of deciduous molar completion. Preadult mortuary practices thus reflect the

fulfilment of social identities over the course of biological maturation, as represented by gradual variation in burial positioning and orientation. Grave good analysis also suggests similar ideals of biosocial maturation, in which appearance of grave goods coincides with the formation of key dental milestones, such as the development of the second deciduous molar. Increased instances of grave goods at later developmental milestones along with patterned burial forms establishes maturation-based identities. The significance of specific grave good placement in burials will be discussed later in this section.

Visual analysis of the preadult sample also yielded evidence of dental attrition in multiple individuals. Attrition was most seen in individuals in Age Group 2 (4-12 years) and Group 3 (13-17 years), where enamel wear was primarily observed on both deciduous and permanent molars. Those individuals that displayed missing teeth were recorded mostly in Age Groups 3 and 4 (18-35 years); these elements limited to second permanent premolars, first molars, and second molars. Bioarchaeological studies of dental wear at Indian Knoll, such as those conducted by Nealis and Seeman (2015) and Paxson (2018), found similar trends in preadults and adults at the site, as well as cross-site comparisons to other Late Archaic sites. Past hypotheses suggested that dental wear was the result of subsistence processing methods, such as utilizing grindstone tools, where transitional subsistence modes between the Late Archaic and Early Woodland periods called for new methods of food cooking and preparation (Nealis and Seeman 2015; Paxson 2018; Walker 1997). For Late Archaic populations, such as Indian Knoll, diets with high shellfish consistency were also proposed to lead to dental wear and later loss and resorption of teeth in matured individuals due to development of carious lesions

(Nealis and Seeman 2015; Paxson 2018). While these studies demonstrated no significant trends between dental wear and populational dietary shifts, differences in attrition and tooth loss between age groups my suggest differences in diet based on biosocial age identities (Nealis and Seeman 2015; Paxson 2018; Walker 1997; Wilham 2016).

Comparisons between age estimations for the preadult sample and the remainder of Indian Knoll interments further demonstrates the importance of reevaluating age estimations in past populations, especially in preadults. Removing the emphasis of chronological age estimation to biological maturation allows for a biosocial approach to understanding the intersectionality between physiological maturation and life- history experiences (Herrmann and Konigsberg 2002; Nealis and Seeman 2015). Results from sample analysis in comparison to whole site burial data allows for a closer examination of individuals that were not prevalent in original site reports, in this case individuals aging into Age Groups 2 and 3. Further investigation is necessary to determine exact causations of development experiences, such as an analysis of dental attrition and pathological indicators throughout the population (Lorentz et al. 2019; Nealis and Seeman 2015; Temple 2014). While this study did not factor in sex and gender into both the dental and mortuary analysis, difference in gender life experiences may demonstrate greater influence over dental maturation.

Mortuary Practices at Indian Knoll

The evidence presented by the mortuary data from Indian Knoll reveal distinct patterns of burial forms for individuals at different maturation ages. Frequent observations of disturbed and rearticulation of remains prior to site excavation suggests Indian Knoll was utilized as a long-term cemetery throughout the site's occupational timeframe, in which later interments either shared or overlapped with previous burials as new interments were added. Burials that show no indication of disturbance can be assumed as either being interred simultaneously or at different intervals. Age Group 4 (18-35 years), for the matter of this research, establishes the cultural framework of "adult" maturation. The main burial form found throughout Indian Knoll is flexed-supine; however, the progression of variability from the earliest age groups to later ages shows patterned conforming of mortuary identities as individuals matured.

Nonetheless, single and multiple interments at Indian Knoll demonstrate intentional placement of associated individuals in order to establish persistent, symbolic relational identities between individuals (Gamble 2017; Letham and Coupland 2019). Similarity in burial form between Age Group 1 and 4 suggests that these groups of individuals possessed similar identities despite differences in maturation. While some variability is seen between maturation ages, general conformism between immature and matured individuals suggest that persistent biosocial identities were assigned early in life and continued throughout the life course. Variability in burial form between individuals both within and across age groups may thus signify differences in ascribed or achieved identity, including those obtained following corporeal death. However, ascribed preadult

identities have been found to follow an established social system among Indian Knoll inhabitants. Nan Rothschild (1979) suggests that social organization of Indian Knoll inhabitants may have revolved around differentiations in status. Analysis of burial form variation between grouped interments demonstrated that burial clusters were not separated based on biological age or sex, as numerous burial groups displayed frequent distribution of both preadults and adults. Burial orientation, positioning, and placement of human remains thus serve as means of distinguishing status groups (Rodan 2020; Rothschild 1979).

Analysis of multiple internment contexts at Indian Knoll concurs with Rothschild's findings by demonstrating varied patterns of associated interments, in which groups show mixed distribution of biological ages and sexes per context. However, distribution of burials over the course of Indian Knoll's occupational timeframe suggests a shift in sociocultural organization. Rebecca Rodan (2020) argues that inhabitants of Indian Knoll shifted from a homogenous hereditary social structure within the mortuary landscape to emphasize ancestral affiliation between regional groups. Using biodistance analysis, frequency comparison of phenotypic variation within temporally separate interments demonstrated a decrease in phenotypic homogeneity in later stratigraphic layers of the mound's construction without compromising cultural burial practices. This suggests that Indian Knoll occupants began to incorporate social agents from surrounding groups or distantly biological relatives in order to establish a persistent ancestral landscape and collective social memory (Rodan 2020). While some hereditary relationships are recognized in the mortuary landscape through biodistance analysis,

inclusion of non-biologically related preadults and adults reinforces collective social relationships (Justice and Temple 2019b; Letham and Coupland 2019). Replication of social memory between individuals of like identities would account for high rates of active rearrangement of previous burials. Placement of immature individuals together, who were not associated with established social groups, would possibly be distinguished with individuals of liked "liminal" statuses (Blom and Knudson 2014; Halcrow and Tayles 2011; Schillaci et al. 2011). Continuous formation of like-status individuals with close biological ages demonstrates Indian Knoll hunter-gatherers recognized a correlation between biological maturation, social identity, and reinforcement of social memory (Justice and Temple 2019b; Rodan 2020; Rothschild 1979). Nonetheless, variation in burial forms at Indian Knoll suggest continual separation of specific social agents according to ascribed statuses, particularly in symbolic placement of grave goods within burial contexts.

While most burials at Indian Knoll possessed no grave goods, the presence-absence dichotomy of grave goods in burial contexts follows Rothschild's findings, in which the presence of certain grave goods indicates specific ascribed or achieved identities in conjunction with burial form. Grave goods can be placed into two different forms: ornamental and utility (Rothschild 1979). The number, placement, and type of such items in burial contexts represent differential statuses. For ornamental grave goods, beads were the most frequent throughout the Indian Knoll site and were constructed out of several regional shellfish (i.e., *Busycon* and *Olivella*) and faunal species (Claassen 2019; Webb 1974). Similar presence of beads between Age Groups 1 and 4 suggests

these materials were used to distinguish multivariate aspects of social identity. Specific color, shape, and material of beads per burial context can relay numerous identities, such as age, gender identity, social roles, and cosmological ordering (Claassen 2019; Deverenski 2000; Janik 2000). For example, Cheryl Claassen (2019) hypothesized stone beads to mark individuals of exclusive status due to rarity in burial contexts; many cases found only in immature individuals. However, total number of beads per burial may reinforce distribution of prestige or social role. Presence of beads or other ornamental implements were sometimes indicators that individuals were interred with textile decorations that deteriorated (Claassen 2019; Marquardt and Watson 2005; Webb 1974). Repeated patterns of bead placement between immature and mature individuals thus reinforces communal ascribed and achieved identities across the mortuary landscape.

Inclusion of animal and stone implements in preadult burials in comparison to mature individuals suggest differences in social identity in relation to socioeconomic ties to environmental agents and subsistence strategies. Though not all burials with grave goods demonstrated the same correlation, noticeable relationships between stone atlatl elements and animal implements, either ornamental or utility, suggests social recognition of the importance of hunter-gatherer identities as well as indicators of stratification of social roles. Specific correlation between atlatl parts and other utility implements such as fish hooks, awls, and drills emphasize the significance of individuals who took part in reciprocal relationships with animal and environment agents through hunting, processing, and disposal of remains. Likewise, symbolic placement of hunter-gatherer implements with ornamental implements, such as carapace rattles, beads, hairpins, and other body

ornaments could be considered added symbols of status, or individuals who fulfilled multiple roles (Claassen 2019; Hill 2011; Ingold 2008; Justice 2017b). Distribution of such grave good pairings were also analyzed by Rothschild (1979), in which grave goods were found to be correlative to ascribed statuses that displayed some partiality for biologically matured individuals to have greater utility implements. However, this observation is proposed on the idea that these implements were utilized by matured individuals in life as well as fulfilling symbolic roles in the burial contexts. Yet, inclusion of utility implements in preadult burials indicates that individuals with patterned grave goods like those of matured individuals shows creation of ascribed identities between associated individuals (Classen 2019; Sofaer-Deverenski 2010; Rodan 2020; Rothschild 1979).

Hunter-Gatherer Ontology at Indian Knoll

Past examinations of hunter-gatherers have rendered ideals of mostly egalitarian forms of sociocultural organization, in which social agents are organized into few or no differential social groups. Expansion of total social dimensions thus were attributed to development of sedentism lifestyles where socioecological adoption of territoriality, material accumulation, and subsistence diversification (Perkl 2009; Rodan 2020; Saxe 1971; Schulting et al. 2020). However, expressed inequalities in hunter-gatherer societies such as Late Archaic Indian Knoll demonstrates non-egalitarian ideals of sociocultural organization, especially through the embodiment of multidimensional social structures. Physical embodiment of inequality, such as systematic placement of "prestigious" grave goods has been noted in various hunter-gatherer societies. For example, the Jomon of the

Yoshigo site (Kiriyama and Kusaka 2017; Tsutaya et al. 2013) and Mesolithic hunter-gatherers of the Zvejnieki site in northeastern Europe (Schulting et al. 2020) yielded distinct formation of burial contexts in order to convey multidimensional social organization of social agents, in which burial form and inclusion of specific grave goods (i.e., beads, pendants, and ornamental implements) conveyed both ascribed status identities as well as indicators of personal life-histories within the greater socioecological structure. Such statuses may be seen through further physiological embodiment over the life course, including in isotopic values of dietary intake, in which variation in food types may indicate possible group-based dietary patterns, such as variation between age, sex, and ascribed or achieved social identities (Kiriyama and Kusaka 2017; Schulting et al. 2020; Tsutaya et al. 2013; Temple 2019b). However, perceived inequality in hunter-gatherer societies, rather than suggesting a socioecological progression towards a non-egalitarian lifestyle, provides evidence of socioecological resilience of hunter-gatherers through maintenance of ecological relationships between social agents, as well as the intersectionality between human social identity and life-history mechanisms (Perkl 2009; Schulting et al. 2020; Temple 2019b; Temple and Stojanowksi 2019)

The findings of this thesis generally follow the assumptions discussed in Nan Rothschild's (1979) study. Here, Late Archaic hunter-gatherers organized social identity according to a select few levels of social hierarchy while still maintaining a persistent regional identity through cultural mortuary practices. Social dimensions are thus differentiated by variation in burial form (i.e., position and orientation) as well as the inclusion of specific grave goods; however, associated interment of biological immature

and mature individuals throughout Indian Knoll's occupation reinforces collective social identity of hunter-gatherers buried in the shell mound (Rodan 2020; Rothschild 1979). These identities are prescribed early in life; the earliest seen in perinatal preadults. Ontological identities are then reinforced throughout the life course as preadults are ascribed identities that associates them with other social agents within the social structure of Indian Knoll society, whether based on kinship, social, or cosmological relations.

Ontological identities of Indian Knoll occupants are integrally tied to non-human social agents. The presence of animal-derived grave goods in the burial contexts across the shell mound highlights that Indian Knoll mortuary practices also incorporated non-human agents into social mortuary landscape. Maintaining relationships to non-human agents, such as the numerous faunal and shellfish species represented, are integral to the socioeconomic stability of persistent hunter-gatherers. Creation, utilization, and burial of animal-made implements and adornments signifies that these materials actively serve as symbolic connections to living and deceased agents by continual accompaniment in the social organization of Indian Knoll throughout an individual's lifetime and beyond (Justice and Temple 2019a; Ingold 2002; Thompson et al. 2014). While most burial contexts at Indian Knoll possessed no grave goods, emphasis of human and non-human relationships in grave good assemblages suggests that the Green River Valley environment was an essential aspect of Archaic hunter-gatherer ontology, in which persistent interaction with non-human agents constituted one aspect of ascribed identities to biosocial aging (Letham and Coupland 2019; Marquardt and Watson 2005; Rodan 2020).

CHAPTER 6: CONCLUSIONS

This thesis analyses the mortuary practices of Late Archaic hunter-gatherers that buried their dead in the Indian Knoll shell mound (15Oh2), in order to understand how persistent mortuary practices embody aspects of biosocial identity as seen through the treatment of human remains in the burial landscape. Biosocial identity, in the context of this research, incorporates the ontology of personhood that is observed in reconstruction of complex social maturity that is encapsulated in the relationship between biological maturation and the recognition of age-based autonomy in correlation to other social agents. Assessment of preadults, or individuals who have yet to reach biosocial maturity, offers in depth insight to the intersectionality of biological plasticity during early life development and how variations in developmental environments affect the trajectory of lived experiences (Halcrow and Tayles 2011; Sofaer 2011). Comparison between the mortuary profiles and dental age estimations conducted thus demonstrate one method of a utilizing a life-history approach to investigate the biological-social intersection of age identity, as well as establish contextual evidence of intra-site variability between individuals.

The mortuary practices at Indian Knoll demonstrate persistent sociocultural ideals throughout the generational demography of the site. Social identities of preadults are ascribed early in life according to individual affiliation with other social agents, both

human and non-human. Ontological beliefs of personhood, therefore, are inherently tied to the reciprocal relationships established between human and non-human agents through socioecological interactions, such as hunting, fishing, and gathering. Therefore, both matured and immature individuals who fulfill such relationships (through physical participation or social affiliation) are thus ascribed differential statuses in the mortuary landscape through specific burial form and inclusion of correlative, status-based grave goods (Classen 2019; Rodan 2020; Rothschild 1979). Ontological identities are only solidified over the life course in cultural subsistence and mortuary practices, as well as strengthening collective cultural identity through replication of collective social affiliation in the mortuary landscape over the course of Indian Knoll's occupation (Bird-David 2018; Elliot et al. 2020; Justice and Temple 2019b; Rodan 2020).

The information and assumptions in this thesis may applied to further investigation of the biosocial experiences of Archaic hunter-gatherers at Indian Knoll. Investigation of preadults may include an in-depth analysis of physiological embodiment of early life experiences, such as variation in growth and development trajectories. Specific investigation includes those of highly impacted areas by physiological trade-offs, such as long bone density and lengths (Thomas 2011; Walker 1997; Wilham 2016). Intrusive dental analysis, if permitted, may also provide further evidence to differentiation in biosocial maturation by demonstrating trends of early life stress through tracing of developmental interruption or evidence of specific environmental relationships to preadult experiences (Nealis and Seeman 2015; Paxson 2018; Tsutaya et al. 2013). Biosocial maturation of Indian Knoll occupants could also be investigated further in

terms of differences between gender identity. However, this method must be oriented to consider cultural ideals of gender identity in juxtaposition of biological sex estimations, if possible.

The continual bioarchaeological study of the Indian Knoll shell mound has provided extensive insight to Late Archaic hunter-gatherer societies in the Green River Valley. While the skeletal and dental data collected from the shell mound population may still provide further evidence for future studies, efforts to repatriate human remains and cultural materials should be highly considered. As discussed in this research, the individuals interred at Indian Knoll constituted an integral part to Indigenous sociocultural relationships, in which these remains continue to possess social agency that contributes to the maintenance of collective ancestral affiliation of modern decent societies (Krmpotich 2010; Mihesuah 2010; Pullar 1995). Returning human remains and their associated grave goods to Indian Knoll (or claimed decent groups) thus acknowledges the agency of the remains and allow the reconstruction of interrupted ancestral mortuary landscapes.

APPENDIX

1A. Burial data for Indian Knoll shell mound (excluding preadult sample).

Burial #	Age Est.	Age Group	Orientation	Position	Multi-Internment	Grave Goods
75	20	4	FLEXED	RIGHT SIDE	N	ABSENT
123	19	4	PARTIAL	SUPINE	N	PRESENT
131	19	4	PARTIAL	SUPINE	N	ABSENT
184	19	4	FLEXED	RIGHT SIDE	N	ABSENT
302	18	4	FLEXED	RIGHT SIDE	N	ABSENT
324	20	4	FLEXED	LEFT SIDE	N	ABSENT
340	18	4	FLEXED	LEFT SIDE	Y	ABSENT
353	18	4	FLEXED	SUPINE	N	PRESENT
366	20	4	FLEXED	SUPINE	Y	ABSENT
391	19	4	FLEXED	RIGHT SIDE	N	ABSENT
403	20	4	FLEXED	RIGHT SIDE	N	ABSENT
429	20	4	FLEXED	SUPINE	Y	ABSENT
576	19	4	FLEXED	SUPINE	N	PRESENT
614	19	4	EXTENDED	SUPINE	Y	PRESENT
715	19	4	FLEXED	LEFT SIDE	N	ABSENT
716	20	4	FLEXED	SUPINE	N	ABSENT
756	19	4	FLEXED	RIGHT SIDE	N	PRESENT
758	19	4	DISTURBED	DISTURBED	N	ABSENT
804	19	4	FLEXED	PRONE	N	ABSENT
814	18	4	DISTURBED	DISTURBED	N	ABSENT
835	20	4	EXTENDED	SUPINE	N	ABSENT
869	20	4	DISTURBED	DISTURBED	Y	ABSENT
9	22	4	FLEXED	LEFT SIDE	N	ABSENT
10	22	4	PARTIAL	PRONE	N	PRESENT
11	32	4	DISTURBED	DISTURBED	N	PRESENT
12	22	4	FLEXED	SUPINE	N	PRESENT
13	22	4	FLEXED	LEFT SIDE	N	ABSENT
15	22	4	EXTENDED	SUPINE	N	ABSENT
17	23	4	PARTIAL	SUPINE	N	ABSENT
22	23	4	FLEXED	RIGHT SIDE	N	ABSENT
23	25	4	DISTURBED	DISTURBED	N	ABSENT
28	26	4	FLEXED	RIGHT SIDE	N	ABSENT

30	22	4	FLEXED	RIGHT SIDE	N	PRESENT
31	34	4	FLEXED	SUPINE	N	ABSENT
32	33	4	FLEXED	LEFT SIDE	N	ABSENT
34	24	4	FLEXED	SUPINE	N	ABSENT
41	32	4	FLEXED	SUPINE	N	ABSENT
42	25	4	EXTENDED	SUPINE	N	PRESENT
44	27	4	FLEXED	RIGHT SIDE	Y	ABSENT
49	21	4	FLEXED	LEFT SIDE	N	PRESENT
50	22	4	FLEXED	RIGHT SIDE	N	ABSENT
52	22	4	FLEXED	RIGHT SIDE	N	ABSENT
55	21	4	PARTIAL	LEFT SIDE	Y	PRESENT
56	21	4	FLEXED	RIGHT SIDE	Y	PRESENT
57	20	4	PARTIAL	SUPINE	Y	PRESENT
58	22	4	PARTIAL	SUPINE	Y	PRESENT
60	35	5	FLEXE	LEFT SIDE	Y	ABSENT
61	32	4	FLEXED	RIGHT SIDE	Y	ABSENT
64	22	4	FLEXED	SUPINE	N	ABSENT
67	28	4	FLEXED	SEATED	Y	ABSENT
68	21	4	FLEXED	SUPINE	N	ABSENT
69	21	4	FLEXED	SUPINE	N	PRESENT
70	23	4	FLEXED	RIGHT SIDE	N	PRESENT
71	35	4	FLEXED	LEFT SIDE	N	ABSENT
72	24	4	FLEXED	LEFT SIDE	N	ABSENT
73	26	4	FLEXED	RIGHT SIDE	N	ABSENT
79	22	4	PARTIAL	SUPINE	N	ABSENT
81	22	4	FLEXED	SUPINE	N	ABSENT
82	26	4	FLEXED	LEFT SIDE	N	ABSENT
83	30	4	FLEXED	SUPINE	N	PRESENT
87	21	4	PARTIAL	RIGHT SIDE	N	PRESENT
88	26	4	FLEXED	SUPINE	N	ABSENT
90	22	4	FLEXED	RIGHT SIDE	N	ABSENT
93	24	4	PARTIAL	SUPINE	N	ABSENT
96	33	5	FLEXED	SUPINE	N	ABSENT
98	24	4	FLEXED	SUPINE	Y	ABSENT
99	22	4	FLEXED	SUPINE	Y	PRESENT
100	35	5	FLEXED	SEATED	N	ABSENT
101	23	4	PARTIAL	SUPINE	Y	PRESENT
103	22	4	FLEXED	SUPINE	Y	ABSENT
105	37	5	FLEXED	SUPINE	N	PRESENT
106	35	4	FLEXED	RIGHT SIDE	N	ABSENT
107	22	4	FLEXED	RIGHT SIDE	N	ABSENT
109	25	4	FLEXED	LEFT SIDE	N	PRESENT
110	28	4	FLEXED	RIGHT SIDE	N	ABSENT
111	30	4	FLEXED	RIGHT SIDE	N	ABSENT
113	25	4	PARTIAL	SUPINE	N	ABSENT
115	28	4	FLEXED	SUPINE	N	ABSENT

117	22	4	FLEXED	SUPINE	N	ABSENT
120	22	4	PARTIAL	SUPINE	Y	ABSENT
121	22	4	FLEXED	SUPINE	N	PRESENT
122	23	4	FLEXED	PRONE	N	ABSENT
124	28	4	FLEXED	LEFT SIDE	N	PRESENT
126	22	4	FLEXED	LEFT SIDE	N	ABSENT
128	22	4	FLEXED	LEFT SIDE	N	ABSENT
133	21	4	FLEXED	SUPINE	N	PRESENT
134	25	4	FLEXED	LEFT SIDE	N	ABSENT
135	22	4	FLEXED	SUPINE	N	PRESENT
140	22	4	FLEXED	RIGHT SIDE	N	PRESENT
142	32	4	FLEXED	LEFT SIDE	N	ABSENT
146	24	4	PARTIAL	SUPINE	Y	PRESENT
148	35	4	FLEXED	LEFT SIDE	N	PRESENT
150	22	4	FLEXED	LEFT SIDE	N	ABSENT
160	22	4	FLEXED	LEFT SIDE	N	PRESENT
167	22	4	DISTURBED	DISTURBED	N	ABSENT
168	22	4	FLEXED	LEFT SIDE	N	PRESENT
179	24	4	FLEXED	LEFT SIDE	N	ABSENT
180	22	4	FLEXED	LEFT SIDE	N	ABSENT
183	22	4	FLEXED	RIGHT SIDE	N	PRESENT
185	24	4	PARTIAL	SUPINE	N	PRESENT
186	24	4	FLEXED	LEFT SIDE	N	ABSENT
190	22	4	PARTIAL	SUPINE	N	PRESENT
191	21	4	FLEXED	RIGHT SIDE	N	PRESENT
197	30	4	FLEXED	RIGHT SIDE	N	ABSENT
203	23	4	FLEXED	SUPINE	N	PRESENT
205	22	4	FLEXED	RIGHT SIDE	N	ABSENT
208	22	4	FLEXED	SUPINE	N	PRESENT
217	21	4	PARTIAL	SUPINE	N	PRESENT
220	22	4	FLEXED	SUPINE	N	ABSENT
227	27	4	FLEXED	RIGHT SIDE	N	ABSENT
229	22	4	FLEXED	LEFT SIDE	N	ABSENT
233	21	4	PARTIAL	SUPINE	N	PRESENT
234	25	4	FLEXED	SUPINE	N	ABSENT
235	28	4	PARTIAL	PRONE	N	PRESENT
237	22	4	PARTIAL	SUPINE	Y	PRESENT
238	23	4	FLEXED	SUPINE	N	ABSENT
240	21	4	FLEXED	SUPINE	Y	ABSENT
242	22	4	PARTIAL	SUPINE	Y	ABSENT
247	32	4	FLEXED	RIGHT SIDE	N	ABSENT
250	22	4	DISTURBED	DISTURBED	N	ABSENT
251	21	4	FLEXED	SUPINE	N	PRESENT
256	24	4	FLEXED	LEFT SIDE	N	ABSENT
258	35	4	FLEXED	LEFT SIDE	N	ABSENT
259	23	4	FLEXED	RIGHT SIDE	N	ABSENT

260	26	4	FLEXED	RIGHT SIDE	N	ABSENT
261	25	4	FLEXED	SUPINE	N	ABSENT
262	24	4	FLEXED	SUPINE	N	ABSENT
263	22	4	PARTIAL	SUPINE	N	ABSENT
267	26	4	FLEXED	RIGHT SIDE	Y	ABSENT
269	22	4	FLEXED	RIGHT SIDE	N	ABSENT
270	29	4	FLEXED	SUPINE	N	ABSENT
272	35	4	FLEXED	RIGHT SIDE	Y	PRESENT
277	23	4	FLEXED	PRONE	N	ABSENT
280	24	4	FLEXED	RIGHT SIDE	N	ABSENT
281	33	4	FLEXED	RIGHT SIDE	N	ABSENT
282	32	4	FLEXED	LEFT SIDE	N	ABSENT
283	24	4	FLEXED	RIGHT SIDE	N	ABSENT
284	24	4	FLEXED	SUPINE	N	ABSENT
285	22	4	FLEXED	LEFT SIDE	N	ABSENT
288	27	4	PARTIAL	SUPINE	N	ABSENT
290	22	4	FLEXED	LEFT SIDE	N	ABSENT
291	21	4	PARTIAL	SUPINE	N	ABSENT
292	28	4	PARTIAL	SUPINE	N	ABSENT
293	26	4	FLEXED	RIGHT SIDE	N	ABSENT
294	24	4	FLEXED	RIGHT SIDE	N	ABSENT
295	22	4	PARTIAL	PRONE	N	PRESENT
297	25	4	FLEXED	SUPINE	N	PRESENT
298	33	4	FLEXED	RIGHT SIDE	N	ABSENT
299	22	4	FLEXED	LEFT SIDE	N	ABSENT
301	21	4	FLEXED	SUPINE	N	ABSENT
305	28	4	FLEXED	SUPINE	Y	PRESENT
306	30	4	FLEXED	SUPINE	Y	ABSENT
307	21	4	FLEXED	SUPINE	Y	ABSENT
309	32	4	FLEXED	SUPINE	Y	ABSENT
310	28	4	FLEXED	SUPINE	Y	PRESENT
311	21	4	FLEXED	LEFT SIDE	N	ABSENT
314	22	4	FLEXED	LEFT SIDE	N	ABSENT
316	31	4	FLEXED	LEFT SIDE	N	ABSENT
319	25	4	FLEXED	RIGHT SIDE	N	ABSENT
322	22	4	FLEXED	LEFT SIDE	Y	PRESENT
323	25	4	PARTIAL	PRONE	Y	ABSENT
326	24	4	DISTURBED	DISTURBED	Y	ABSENT
328	22	4	FLEXED	PRONE	N	PRESENT
330	24	4	FLEXED	SUPINE	N	ABSENT
331	24	4	FLEXED	RIGHT SIDE	N	ABSENT
332	30	4	FLEXED	LEFT SIDE	N	ABSENT
334	30	4	FLEXED	PRONE	Y	ABSENT
338	22	4	FLEXED	LEFT SIDE	N	ABSENT
342	22	4	FLEXED	RIGHT SIDE	N	ABSENT
343	33	4	FLEXED	RIGHT SIDE	N	ABSENT

345	23	4	FLEXED	SUPINE	N	PRESENT
346	21	4	PARTIAL	SUPINE	N	ABSENT
347	28	4	FLEXED	LEFT SIDE	N	PRESENT
349	24	4	FLEXED	LEFT SIDE	N	ABSENT
357	35	5	FLEXED	RIGHT SIDE	N	PRESENT
363	32	4	FLEXED	RIGHT SIDE	N	PRESENT
364	33	4	FLEXED	SUPINE	N	ABSENT
365	28	4	FLEXED	LEFT SIDE	Y	ABSENT
368	25	4	PARTIAL	SUPINE	N	ABSENT
373	28	4	FLEXED	SUPINE	Y	ABSENT
374	22	4	FLEXED	SUPINE	Y	PRESENT
376	22	4	FLEXED	RIGHT SIDE	N	ABSENT
377	35	4	FLEXED	SUPINE	N	ABSENT
379	21	4	FLEXED	LEFT SIDE	Y	PRESENT
382	22	4	FLEXED	SUPINE	N	ABSENT
383	32	4	FLEXED	RIGHT SIDE	N	ABSENT
385	22	4	FLEXED	RIGHT SIDE	N	ABSENT
390	22	4	FLEXED	RIGHT SIDE	Y	PRESENT
397	27	4	FLEXED	LEFT SIDE	N	ABSENT
398	21	4	FLEXED	PRONE	N	ABSENT
400	22	4	FLEXED	SUPINE	N	ABSENT
401	21	4	FLEXED	SUPINE	N	ABSENT
402	24	4	FLEXED	LEFT SIDE	N	ABSENT
404	22	4	FLEXED	RIGHT SIDE	N	ABSENT
406	30	4	FLEXED	SUPINE	N	ABSENT
407	22	4	FLEXED	RIGHT SIDE	N	ABSENT
408	24	4	FLEXED	PRONE	N	ABSENT
409	22	4	FLEXED	SUPINE	N	PRESENT
410	28	4	FLEXED	LEFT SIDE	N	ABSENT
411	22	4	FLEXED	PRONE	N	PRESENT
413	28	4	FLEXED	SUPINE	N	PRESENT
417	22	4	FLEXED	LEFT SIDE	Y	ABSENT
418	22	4	PARTIAL	RIGHT SIDE	Y	ABSENT
423	22	4	FLEXED	RIGHT SIDE	N	ABSENT
424	28	4	FLEXED	LEFT SIDE	N	ABSENT
425	22	4	FLEXED	RIGHT SIDE	N	ABSENT
430	35	4	FLEXED	RIGHT SIDE	Y	ABSENT
436	29	4	FLEXED	LEFT SIDE	N	PRESENT
440	21	4	FLEXED	SUPINE	N	ABSENT
447	28	4	FLEXED	RIGHT SIDE	N	ABSENT
449	22	4	FLEXED	LEFT SIDE	N	PRESENT
451	30	4	FLEXED	RIGHT SIDE	N	ABSENT
454	23	4	FLEXED	RIGHT SIDE	N	ABSENT
455	25	4	FLEXED	LEFT SIDE	N	ABSENT
456	24	4	FLEXED	PRONE	N	PRESENT
457	32	4	FLEXED	LEFT SIDE	N	ABSENT

461	32	4	FLEXED	SUPINE	N	ABSENT
462	22	4	FLEXED	RIGHT SIDE	N	PRESENT
464	22	4	FLEXED	RIGHT SIDE	N	ABSENT
465	28	4	FLEXED	LEFT SIDE	N	PRESENT
467	28	4	PARTIAL	SUPINE	N	PRESENT
470	21	4	FLEXED	RIGHT SIDE	N	PRESENT
471	28	4	PARTIAL	SUPINE	N	PRESENT
473	21	4	FLEXED	SUPINE	N	ABSENT
474	21	4	FLEXED	SUPINE	N	PRESENT
475	28	4	FLEXED	RIGHT SIDE	N	ABSENT
476	25	4	FLEXED	SUPINE	N	ABSENT
480	22	4	FLEXED	LEFT SIDE	Y	ABSENT
481	22	4	FLEXED	PRONE	N	PRESENT
484	22	4	FLEXED	SUPINE	N	ABSENT
485	23	4	FLEXED	RIGHT SIDE	N	ABSENT
486	33	4	FLEXED	SUPINE	N	PRESENT
487	35	4	FLEXED	LEFT SIDE	N	PRESENT
489	29	4	FLEXED	PRONE	N	PRESENT
490	22	4	FLEXED	PRONE	N	ABSENT
491	24	4	FLEXED	RIGHT SIDE	N	ABSENT
492	30	4	PARTIAL	SUPINE	N	PRESENT
493	25	4	DISTURBED	DISTURBED	N	ABSENT
494	22	4	FLEXED	SUPINE	N	PRESENT
496	23	4	FLEXED	SUPINE	N	ABSENT
507	22	4	FLEXED	PRONE	N	ABSENT
508	28	4	FLEXED	RIGHT SIDE	N	ABSENT
509	22	4	FLEXED	RIGHT SIDE	N	PRESENT
510	28	4	FLEXED	SUPINE	N	ABSENT
514	28	4	FLEXED	PRONE	Y	ABSENT
516	32	4	FLEXED	LEFT SIDE	N	ABSENT
518	21	4	FLEXED	RIGHT SIDE	N	PRESENT
519	23	4	FLEXED	SUPINE	N	ABSENT
520	22	4	FLEXED	SUPINE	N	ABSENT
522	22	4	FLEXED	RIGHT SIDE	N	ABSENT
525	21	4	FLEXED	RIGHT SIDE	Y	ABSENT
527	22	4	FLEXED	RIGHT SIDE	Y	ABSENT
528	32	4	FLEXED	LEFT SIDE	N	ABSENT
529	22	4	FLEXED	RIGHT SIDE	Y	PRESENT
532	22	4	FLEXED	SUPINE	N	ABSENT
536	21	4	DISTURBED	DISTURBED	N	ABSENT
537	32	4	DISTURBED	DISTURBED	N	PRESENT
540	32	4	PARTIAL	RIGHT SIDE	N	PRESENT
541	22	4	FLEXED	SUPINE	N	ABSENT
542	22	4	FLEXED	RIGHT SIDE	N	ABSENT
543	26	4	FLEXED	PRONE	N	PRESENT
545	21	4	PARTIAL	RIGHT SIDE	N	ABSENT

546	26	4	FLEXED	RIGHT SIDE	N	ABSENT
547	28	4	FLEXED	RIGHT SIDE	N	ABSENT
548	31	4	FLEXED	RIGHT SIDE	N	ABSENT
551	28	4	FLEXED	SUPINE	N	ABSENT
552	22	4	FLEXED	SUPINE	N	ABSENT
555	22	4	PARTIAL	RIGHT SIDE	N	ABSENT
558	25	4	FLEXED	LEFT SIDE	N	ABSENT
559	29	4	FLEXED	RIGHT SIDE	N	ABSENT
560	22	4	FLEXED	RIGHT SIDE	N	PRESENT
561	24	4	PARTIAL	LEFT SIDE	N	PRESENT
564	22	4	PARTIAL	RIGHT SIDE	Y	ABSENT
565	22	4	FLEXED	SUPINE	Y	ABSENT
568	23	4	FLEXED	LEFT SIDE	N	ABSENT
570	21	4	FLEXED	RIGHT SIDE	N	ABSENT
574	28	4	FLEXED	RIGHT SIDE	N	ABSENT
575	22	4	FLEXED	LEFT SIDE	N	PRESENT
577	22	4	FLEXED	PRONE	N	PRESENT
578	28	4	FLEXED	LEFT SIDE	N	PRESENT
584	23	4	FLEXED	SUPINE	N	ABSENT
585	23	4	PARTIAL	SUPINE	N	PRESENT
586	22	4	FLEXED	LEFT SIDE	N	PRESENT
587	23	4	FLEXED	LEFT SIDE	N	PRESENT
590	22	4	FLEXED	LEFT SIDE	N	ABSENT
591	22	4	FLEXED	RIGHT SIDE	N	ABSENT
592	22	4	FLEXED	RIGHT SIDE	N	ABSENT
595	24	4	FLEXED	RIGHT SIDE	N	ABSENT
597	22	4	FLEXED	LEFT SIDE	N	ABSENT
598	22	4	FLEXED	LEFT SIDE	Y	ABSENT
600	28	4	FLEXED	SUPINE	N	ABSENT
601	22	4	FLEXED	SUPINE	N	ABSENT
602	35	4	FLEXED	PRONE	N	ABSENT
603	21	4	FLEXED	RIGHT SIDE	N	ABSENT
604	28	4	FLEXED	LEFT SIDE	N	PRESENT
605	24	4	FLEXED	LEFT SIDE	N	ABSENT
608	23	4	FLEXED	PRONE	N	ABSENT
611	25	4	EXTENDED	SUPINE	Y	PRESENT
612	22	4	EXTENDED	SUPINE	Y	PRESENT
613	22	4	EXTENDED	SUPINE	Y	PRESENT
617	26	4	FLEXED	RIGHT SIDE	N	PRESENT
619	22	4	FLEXED	SUPINE	N	ABSENT
620	23	4	FLEXED	LEFT SIDE	N	ABSENT
621	24	4	FLEXED	LEFT SIDE	N	ABSENT
629	26	4	FLEXED	LEFT SIDE	N	ABSENT
634	21	4	FLEXED	SUPINE	N	PRESENT
635	24	4	FLEXED	PRONE	N	ABSENT
636	23	4	FLEXED	RIGHT SIDE	N	ABSENT

638	22	4	PARTIAL	LEFT SIDE	N	PRESENT
639	23	4	PARTIAL	RIGHT SIDE	Y	ABSENT
640	25	4	UNKNOWN	SUPINE	Y	ABSENT
641	25	4	FLEXED	RIGHT SIDE	N	PRESENT
642	22	4	FLEXED	SEATED	N	ABSENT
643	29	4	FLEXED	LEFT SIDE	N	ABSENT
644	23	4	FLEXED	PRONE	N	ABSENT
648	22	4	PARTIAL	RIGHT SIDE	N	ABSENT
652	24	4	FLEXED	SUPINE	N	ABSENT
653	31	4	FLEXED	RIGHT SIDE	N	ABSENT
656	24	4	PARTIAL	RIGHT SIDE	N	ABSENT
658	23	4	FLEXED	RIGHT SIDE	N	ABSENT
661	28	4	FLEXED	SUPINE	N	PRESENT
663	24	4	FLEXED	RIGHT SIDE	N	ABSENT
665	29	4	FLEXED	RIGHT SIDE	N	ABSENT
667	22	4	FLEXED	SUPINE	N	ABSENT
668	26	4	PARTIAL	RIGHT SIDE	N	ABSENT
669	22	4	FLEXED	RIGHT SIDE	N	PRESENT
670	24	4	FLEXED	RIGHT SIDE	N	PRESENT
672	22	4	FLEXED	RIGHT SIDE	N	ABSENT
675	25	4	DISTURBED	DISTURBED	N	ABSENT
677	22	4	DISTURBED	DISTURBED	N	ABSENT
685	31	4	FLEXED	LEFT SIDE	N	ABSENT
687	28	4	EXTENDED	RIGHT SIDE	N	PRESENT
690	33	4	PARTIAL	SUPINE	N	ABSENT
696	22	4	FLEXED	RIGHT SIDE	N	PRESENT
697	22	4	PARTIAL	SUPINE	N	PRESENT
698	22	4	PARTIAL	SUPINE	N	PRESENT
701	21	4	PARTIAL	LEFT SIDE	N	PRESENT
703	28	4	FLEXED	LEFT SIDE	N	ABSENT
708	25	4	DISTURBED	DISTURBED	N	PRESENT
709	25	4	FLEXED	LEFT SIDE	N	PRESENT
712	26	4	PARTIAL	RIGHT SIDE	N	ABSENT
713	27	4	FLEXED	RIGHT SIDE	N	ABSENT
717	26	4	PARTIAL	SUPINE	Y	ABSENT
725	22	4	FLEXED	LEFT SIDE	N	ABSENT
727	22	4	PARTIAL	RIGHT SIDE	N	ABSENT
731	22	4	FLEXED	PRONE	N	ABSENT
732	23	4	FLEXED	PRONE	N	ABSENT
735	24	4	PARTIAL	LEFT SIDE	N	ABSENT
737	26	4	FLEXED	LEFT SIDE	N	ABSENT
738	22	4	DISTURBED	DISTURBED	N	ABSENT
739	22	4	FLEXED	LEFT SIDE	N	ABSENT
742	27	4	FLEXED	RIGHT SIDE	N	ABSENT
744	24	4	FLEXED	RIGHT SIDE	N	PRESENT
745	23	4	FLEXED	LEFT SIDE	N	ABSENT

748	22	4	FLEXED	RIGHT SIDE	N	ABSENT
755	28	4	PARTIAL	LEFT SIDE	N	PRESENT
761	21	4	FLEXED	LEFT SIDE	N	PRESENT
763	35	5	FLEXED	RIGHT SIDE	N	ABSENT
765	29	4	FLEXED	RIGHT SIDE	N	ABSENT
766	22	4	FLEXED	LEFT SIDE	N	PRESENT
771	22	4	DISTURBED	DISTURBED	N	ABSENT
772	22	4	PARTIAL	LEFT SIDE	N	PRESENT
774	23	4	PARTIAL	RIGHT SIDE	N	PRESENT
775	21	4	PARTIAL	SUPINE	N	ABSENT
777	26	4	FLEXED	LEFT SIDE	N	ABSENT
778	22	4	FLEXED	RIGHT SIDE	N	ABSENT
780	24	4	FLEXED	LEFT SIDE	Y	ABSENT
783	29	4	PARTIAL	SUPINE	N	ABSENT
786	22	4	FLEXED	PRONE	N	ABSENT
789	23	4	FLEXED	LEFT SIDE	N	ABSENT
790	22	4	FLEXED	RIGHT SIDE	N	ABSENT
791	21	4	PARTIAL	SUPINE	N	ABSENT
792	28	4	FLEXED	RIGHT SIDE	N	ABSENT
794	23	4	PARTIAL	RIGHT SIDE	N	ABSENT
799	27	4	PARTIAL	RIGHT SIDE	N	PRESENT
802	21	4	DISTURBED	DISTURBED	Y	PRESENT
810	23	4	FLEXED	LEFT SIDE	Y	PRESENT
812	29	4	DISTURBED	DISTURBED	N	ABSENT
813	22	4	DISTURBED	DISTURBED	N	ABSENT
816	28	4	PARTIAL	LEFT SIDE	N	ABSENT
817	23	4	FLEXED	RIGHT SIDE	N	ABSENT
819	22	4	PARTIAL	RIGHT SIDE	N	ABSENT
821	22	4	PARTIAL	LEFT SIDE	Y	ABSENT
825	30	4	FLEXED	RIGHT SIDE	N	ABSENT
827	27	4	PARTIAL	LEFT SIDE	N	PRESENT
829	22	4	PARTIAL	SUPINE	N	ABSENT
831	26	4	FLEXED	LEFT SIDE	N	PRESENT
837	23	4	PARTIAL	SUPINE	N	ABSENT
840	24	4	PARTIAL	LEFT SIDE	N	ABSENT
841	22	4	PARTIAL	SUPINE	N	ABSENT
843	23	4	FLEXED	RIGHT SIDE	N	ABSENT
845	28	4	FLEXED	RIGHT SIDE	N	PRESENT
847	22	4	FLEXED	RIGHT SIDE	N	ABSENT
848	23	4	FLEXED	SUPINE	N	ABSENT
849	23	4	FLEXED	RIGHT SIDE	N	ABSENT
850	22	4	FLEXED	PRONE	N	ABSENT
851	21	4	PARTIAL	LEFT SIDE	N	PRESENT
852	28	4	FLEXED	RIGHT SIDE	N	PRESENT
853	23	4	PARTIAL	LEFT SIDE	N	PRESENT
854	26	4	FLEXED	RIGHT SIDE	N	ABSENT

858	24	4	FLEXED	LEFT SIDE	N	ABSENT
859	27	4	FLEXED	LEFT SIDE	N	ABSENT
860	28	4	PARTIAL	LEFT SIDE	N	PRESENT
864	30	4	DISTURBED	DISTURBED	Y	ABSENT
865	24	4	PARTIAL	SUPINE	Y	ABSENT
866	24	4	FLEXED	RIGHT SIDE	Y	ABSENT
867	24	4	FLEXED	LEFT SIDE	N	ABSENT
868	28	4	PARTIAL	LEFT SIDE	N	PRESENT
870	25	4	DISTURBED	DISTURBED	Y	ABSENT
872	22	4	FLEXED	SUPINE	Y	ABSENT
874	23	4	DISTURBED	DISTURBED	Y	ABSENT
880	22	4	DISTURBED	DISTURBED	Y	ABSENT
43	40	5	FLEXED	RIGHT SIDE	Y	ABSENT
45	50	5	FLEXED	LEFT SIDE	N	ABSENT
66	40	5	FLEXED	RIGHT SIDE	Y	ABSENT
108	37	5	FLEXED	RIGHT SIDE	N	ABSENT
141	38	5	FLEXED	LEFT SIDE	N	ABSENT
154	37	5	FLEXED	RIGHT SIDE	N	ABSENT
156	37	5	FLEXED	LEFT SIDE	N	ABSENT
166	37	5	FLEXED	RIGHT SIDE	N	ABSENT
216	47	5	DISTURBED	DISTURBED	N	ABSENT
218	37	5	FLEXED	LEFT SIDE	N	PRESENT
230	45	5	FLEXED	RIGHT SIDE	N	ABSENT
252	37	5	FLEXED	LEFT SIDE	N	ABSENT
266	40	5	FLEXED	RIGHT SIDE	Y	ABSENT
273	40	5	PARTIAL	RIGHT SIDE	N	ABSENT
296	45	5	FLEXED	SUPINE	N	ABSENT
327	40	5	PARTIAL	LEFT SIDE	Y	ABSENT
352	36	5	FLEXED	LEFT SIDE	N	PRESENT
441	40	5	PARTIAL	RIGHT SIDE	N	ABSENT
446	50	5	FLEXED	RIGHT SIDE	N	ABSENT
452	50	5	FLEXED	RIGHT SIDE	Y	PRESENT
463	37	5	FLEXED	SUPINE	N	PRESENT
466	40	5	FLEXED	RIGHT SIDE	N	ABSENT
477	45	5	FLEXED	RIGHT SIDE	N	PRESENT
499	50	5	FLEXED	LEFT SIDE	N	ABSENT
539	37	5	FLEXED	RIGHT SIDE	N	ABSENT
659	40	5	PARTIAL	RIGHT SIDE	N	ABSENT
695	40	5	FLEXED	LEFT SIDE	N	ABSENT
702	53	5	PARTIAL	RIGHT SIDE	N	PRESENT
705	43	5	FLEXED	PRONE	N	ABSENT
733	40	5	FLEXED	SUPINE	N	ABSENT
736	50	5	FLEXED	LEFT SIDE	N	PRESENT
797	40	5	FLEXED	RIGHT SIDE	N	ABSENT
808	45	5	FLEXED	LEFT SIDE	N	PRESENT
863	42	5	PARTIAL	LEFT SIDE	Y	ABSENT

143	60	5	FLEXED	LEFT SIDE	N	ABSENT
175	60	5	FLEXED	RIGHT SIDE	N	ABSENT
562	60	5	FLEXED	PRONE	N	ABSENT
1	0	1	DISTURBED	DISTURBED	Y	PRESENT
2	0	1	DISTURBED	DISTURBED	Y	ABSENT
4	2	1	PARTIAL	SUPINE	N	ABSENT
7	4	2	DISTURBED	DISTURBED	N	ABSENT
8	0	1	PARTIAL	LEFT SIDE	N	ABSENT
14	0	1	FLEXED	RIGHT SIDE	N	ABSENT
20	1	1	PARTIAL	LEFT SIDE	N	PRESENT
25	1	1	PARTIAL	SUPINE	N	ABSENT
26	0	1	PARTIAL	LEFT SIDE	N	ABSENT
27	0	1	PARTIAL	LEFT SIDE	N	ABSENT
29	0	1	PARTIAL	SUPINE	N	PRESENT
33	0	1	PARTIAL	LEFT SIDE	N	PRESENT
35	3	1	FLEXED	LEFT SIDE	N	ABSENT
36	0	1	PARTIAL	SUPINE	N	ABSENT
40	0	1	PARTIAL	SUPINE	N	ABSENT
63	2	1	FLEXED	SUPINE	N	PRESENT
65	0	1	FLEXED	SUPINE	N	ABSENT
74	0	1	FLEXED	RIGHT SIDE	N	ABSENT
76	0	1	PARTIAL	SUPINE	N	ABSENT
77	1	1	FLEXED	SUPINE	N	ABSENT
84	0	1	DISTURBED	DISTURBED	N	ABSENT
91	0	1	PARTIAL	SUPINE	N	ABSENT
92	1	1	PARTIAL	RIGHT SIDE	N	PRESENT
94	1	1	PARTIAL	RIGHT SIDE	N	ABSENT
102			PARTIAL	SUPINE	Y	ABSENT
104	0	1	DISTURBED	DISTURBED	Y	ABSENT
112	1	1	PARTIAL	RIGHT SIDE	N	ABSENT
114	0	1	DISTURBED	DISTURBED	N	ABSENT
116	0	1	PARTIAL	SUPINE	N	PRESENT
118	3	1	PARTIAL	SUPINE	N	PRESENT
119	1	1	PARTIAL	SUPINE	N	ABSENT
130	1	1	PARTIAL	SUPINE	N	ABSENT
132	0	1	DISTURBED	DISTURBED	N	ABSENT
137	1	1	PARTIAL	SUPINE	N	ABSENT
139	2	1	PARTIAL	SUPINE	N	ABSENT
147	0	1	DISTURBED	DISTURBED	Y	ABSENT
151	1	1	PARTIAL	SUPINE	N	PRESENT
152	1	1	PARTIAL	SUPINE	N	ABSENT
155	1	1	DISTURBED	DISTURBED	N	PRESENT
158	3	1	PARTIAL	SUPINE	N	PRESENT
159	1	1	FLEXED	LEFT SIDE	N	PRESENT
161	0	1	PARTIAL	RIGHT SIDE	N	ABSENT
162	2	1	PARTIAL	PRONE	N	ABSENT

163	0	1	PARTIAL	LEFT SIDE	N	ABSENT
164	0	1	PARTIAL	RIGHT SIDE	N	ABSENT
165	3	1	DISTURBED	DISTURBED	N	ABSENT
171	0	1	PARTIAL	SUPINE	N	PRESENT
173	0	1	DISTURBED	DISTURBED	N	ABSENT
174	0	1	DISTURBED	DISTURBED	N	PRESENT
182	0	1	PARTIAL	LEFT SIDE	N	ABSENT
187	1	1	FLEXED	SUPINE	N	ABSENT
188	0	1	DISTURBED	DISTURBED	N	ABSENT
189	1	1	DISTURBED	DISTURBED	N	PRESENT
193	0	1	FLEXED	SUPINE	N	ABSENT
195	0	1	FLEXED	SEATED	N	ABSENT
198	0	1	FLEXED	SUPINE	N	PRESENT
201	0	1	DISTURBED	DISTURBED	N	ABSENT
202	1	1	PARTIAL	UNKNOWN	N	PRESENT
204	1	1	DISTURBED	DISTURBED	N	ABSENT
207	0	1	PARTIAL	SUPINE	N	ABSENT
210	0	1	PARTIAL	SUPINE	N	ABSENT
213	0	1	FLEXED	SUPINE	N	ABSENT
214	1	1	FLEXED	RIGHT SIDE	N	ABSENT
221	2	1	FLEXED	SUPINE	N	ABSENT
222	0	1	PARTIAL	LEFT SIDE	Y	ABSENT
223	0	1	PARTIAL	SUPINE	Y	ABSENT
226	0	1	PARTIAL	LEFT SIDE	N	PRESENT
231	0	1	DISTURBED	DISTURBED	N	ABSENT
239	0	1	DISTURBED	DISTURBED	N	ABSENT
241	0	1	DISTURBED	DISTURBED	N	ABSENT
243	0	1	DISTURBED	DISTURBED	Y	ABSENT
246	0	1	PARTIAL	SUPINE	N	PRESENT
249	0	1	DISTURBED	DISTURBED	N	ABSENT
257	0	1	FLEXED	LEFT SIDE	N	PRESENT
268	3	1	FLEXED	SUPINE	N	PRESENT
271	2	1	FLEXED	SUPINE	Y	PRESENT
274	2	1	FLEXED	LEFT SIDE	N	ABSENT
275	0	1	PARTIAL	RIGHT SIDE	Y	ABSENT
300	1	1	FLEXED	SUPINE	N	ABSENT
303	1	1	FLEXED	RIGHT SIDE	Y	ABSENT
312	1	1	FLEXED	SUPINE	N	PRESENT
318	3	1	FLEXED	LEFT SIDE	N	ABSENT
320	0	1	PARTIAL	SUPINE	N	ABSENT
321	1	1	PARTIAL	RIGHT SIDE	N	PRESENT
325	1	1	FLEXED	RIGHT SIDE	Y	ABSENT
337	2	1	PARTIAL	RIGHT SIDE	N	PRESENT
341	0	1	DISTURBED	DISTURBED	Y	ABSENT
344	2	1	FLEXED	RIGHT SIDE	N	ABSENT
351	2	1	FLEXED	SUPINE	N	PRESENT

358	0	1	FLEXED	SUPINE	N	PRESENT
359	0	1	FLEXED	RIGHT SIDE	N	PRESENT
360	0	1	FLEXED	RIGHT SIDE	N	ABSENT
362	0	1	FLEXED	LEFT SIDE	N	ABSENT
367	2	1	FLEXED	PRONE	N	PRESENT
375	3	1	FLEXED	SUPINE	Y	ABSENT
380	3	1	FLEXED	LEFT SIDE	N	PRESENT
387	1	1	FLEXED	SUPINE	N	PRESENT
389	0	1	FLEXED	LEFT SIDE	N	ABSENT
392	1	1	FLEXED	SUPINE	N	ABSENT
394	2	1	FLEXED	LEFT SIDE	N	PRESENT
396	2	1	FLEXED	LEFT SIDE	N	PRESENT
415	1	1	FLEXED	LEFT SIDE	N	PRESENT
419	3	1	FLEXED	SUPINE	N	ABSENT
420	2	1	FLEXED	LEFT SIDE	N	ABSENT
427	0	1	FLEXED	SUPINE	N	ABSENT
431	3	1	FLEXED	LEFT SIDE	Y	ABSENT
432	2	1	PARTIAL	SUPINE	Y	ABSENT
434	0	1	FLEXED	SUPINE	N	PRESENT
435	2	1	PARTIAL	RIGHT SIDE	N	ABSENT
437	3	1	FLEXED	RIGHT SIDE	N	ABSENT
442	1	1	PARTIAL	LEFT SIDE	N	ABSENT
443	0	1	FLEXED	RIGHT SIDE	N	ABSENT
445	0	1	FLEXED	LEFT SIDE	N	PRESENT
448	1	1	FLEXED	LEFT SIDE	N	ABSENT
450	0	1	FLEXED	PRONE	N	PRESENT
459	0	1	FLEXED	RIGHT SIDE	N	PRESENT
460	1	1	FLEXED	SUPINE	N	ABSENT
468	1	1	PARTIAL	LEFT SIDE	N	ABSENT
469	1	1	PARTIAL	LEFT SIDE	N	PRESENT
482	0	1	PARTIAL	RIGHT SIDE	N	ABSENT
497	0	1	PARTIAL	LEFT SIDE	N	ABSENT
498	0	1	FLEXED	LEFT SIDE	N	PRESENT
504	0	1	FLEXED	RIGHT SIDE	N	ABSENT
505	3	1	PARTIAL	PRONE	N	ABSENT
506	1	1	FLEXED	SUPINE	N	PRESENT
511	2	1	FLEXED	LEFT SIDE	N	ABSENT
512	1	1	PARTIAL	SUPINE	N	PRESENT
513	1	1	FLEXED	SUPINE	Y	PRESENT
517	3	1	FLEXED	PRONE	N	PRESENT
521	1	1	PARTIAL	PRONE	N	ABSENT
524	2	1	FLEXED	SUPINE	N	ABSENT
526	0	1	FLEXED	LEFT SIDE	Y	ABSENT
531	1	1	FLEXED	LEFT SIDE	N	PRESENT
533	1	1	FLEXED	SUPINE	N	ABSENT
534	0	1	FLEXED	RIGHT SIDE	N	ABSENT

535	0	1	PARTIAL	SUPINE	N	ABSENT
538	2	1	PARTIAL	LEFT SIDE	N	ABSENT
544	3	1	PARTIAL	SUPINE	N	PRESENT
550	1	1	FLEXED	SUPINE	N	ABSENT
553	1	1	PARTIAL	SUPINE	N	PRESENT
554	0	1	FLEXED	SUPINE	N	ABSENT
556	1	1	PARTIAL	LEFT SIDE	N	ABSENT
557	1	1	FLEXED	SUPINE	N	ABSENT
569	2	1	PARTIAL	SUPINE	N	ABSENT
572	3	1	FLEXED	SUPINE	N	PRESENT
573	0	1	FLEXED	RIGHT SIDE	N	ABSENT
579	1	1	FLEXED	LEFT SIDE	N	PRESENT
580	3	1	FLEXED	RIGHT SIDE	N	ABSENT
581	3	1	FLEXED	SUPINE	Y	ABSENT
582	0	1	PARTIAL	SUPINE	N	PRESENT
594	0	1	PARTIAL	SUPINE	N	ABSENT
606	1	1	DISTURBED	DISTURBED	Y	PRESENT
607		1	PARTIAL	RIGHT SIDE	Y	PRESENT
609	1	1	PARTIAL	SUPINE	Y	PRESENT
610	3	1	FLEXED	SUPINE	Y	PRESENT
615	0	1	PARTIAL	SUPINE	N	ABSENT
616	1	1	FLEXED	LEFT SIDE	N	ABSENT
622	3	1	FLEXED	SUPINE	N	PRESENT
625	1	1	PARTIAL	SUPINE	N	ABSENT
626	1	1	PARTIAL	SUPINE	N	ABSENT
627	1	1	PARTIAL	SUPINE	N	ABSENT
628	0	1	PARTIAL	RIGHT SIDE	N	PRESENT
630	0	1	PARTIAL	RIGHT SIDE	N	ABSENT
631	0	1	PARTIAL	LEFT SIDE	N	ABSENT
632	2	1	DISTURBED	DISTURBED	N	PRESENT
633	1	1	PARTIAL	RIGHT SIDE	N	ABSENT
645	0	1	PARTIAL	SUPINE	N	ABSENT
646	3	1	PARTIAL	LEFT SIDE	N	ABSENT
647	0	1	PARTIAL	SUPINE	N	PRESENT
649	3	1	PARTIAL	RIGHT SIDE	N	PRESENT
651	3	1	FLEXED	SUPINE	N	PRESENT
654	2	1	PARTIAL	SUPINE	N	PRESENT
657	2	1	PARTIAL	RIGHT SIDE	N	PRESENT
660	1	1	PARTIAL	LEFT SIDE	N	PRESENT
662	0	1	PARTIAL	RIGHT SIDE	N	ABSENT
671	0	1	PARTIAL	RIGHT SIDE	N	ABSENT
673	0	1	PARTIAL	SUPINE	N	ABSENT
674	0	1	PARTIAL	SUPINE	N	ABSENT
676	1	1	DISTURBED	DISTURBED	N	ABSENT
679	1	1	PARTIAL	LEFT SIDE	N	PRESENT
680	0	1	PARTIAL	RIGHT SIDE	N	PRESENT

682	0	1	PARTIAL	SUPINE	N	ABSENT
684	3	1	PARTIAL	RIGHT SIDE	N	ABSENT
686	2	1	PARTIAL	LEFT SIDE	N	PRESENT
689	3	1	PARTIAL	RIGHT SIDE	N	ABSENT
693	3	1	DISTURBED	DISTURBED	N	ABSENT
699	0	1	PARTIAL	LEFT SIDE	N	ABSENT
700	0	1	PARTIAL	SUPINE	N	ABSENT
704	3	1	PARTIAL	SUPINE	N	PRESENT
707	0	1	DISTURBED	DISTURBED	N	ABSENT
710	0	1	DISTURBED	DISTURBED	N	ABSENT
711	0	1	PARTIAL	RIGHT SIDE	N	PRESENT
714	1	1	PARTIAL	PRONE	N	ABSENT
719	3	1	DISTURBED	DISTURBED	Y	ABSENT
721	0	1	PARTIAL	SUPINE	N	PRESENT
722	2	1	PARTIAL	RIGHT SIDE	N	ABSENT
726	3	1	PARTIAL	LEFT SIDE	N	PRESENT
728	1	1	PARTIAL	LEFT SIDE	N	PRESENT
729	0	1	PARTIAL	UNKOWN	N	PRESENT
730	0	1	PARTIAL	LEFT SIDE	N	ABSENT
734	0	1	PARTIAL	PRONE	N	PRESENT
741	0	1	PARTIAL	SUPINE	N	ABSENT
743	1	1	PARTIAL	SUPINE	N	PRESENT
747	3	1	PARTIAL	SUPINE	N	PRESENT
749	0	1	PARTIAL	SUPINE	N	PRESENT
750	0	1	DISTURBED	DISTURBED	N	PRESENT
752	0	1	DISTURBED	DISTURBED	N	ABSENT
759	0	1	DISTURBED	DISTURBED	N	PRESENT
762	0	1	PARTIAL	RIGHT SIDE	N	ABSENT
764	1	1	FLEXED	RIGHT SIDE	N	ABSENT
767	0	1	PARTIAL	LEFT SIDE	Y	PRESENT
768	0	1	PARTIAL	PRONE	Y	ABSENT
773	3	1	PARTIAL	SUPINE	N	ABSENT
776	0	1	DISTURBED	DISTURBED	N	PRESENT
779	0	1	PARTIAL	SUPINE	N	PRESENT
782	3	1	PARTIAL	RIGHT SIDE	Y	PRESENT
784	1	1	DISTURBED	DISTURBED	N	ABSENT
787	0	1	DISTURBED	DISTURBED	N	ABSENT
788	0	1	DISTURBED	DISTURBED	N	PRESENT
793	3	1	PARTIAL	SUPINE	N	PRESENT
795	1	1	PARTIAL	SUPINE	Y	ABSENT
800	0	1	DISTURBED	DISTURBED	N	ABSENT
801	0	1	PARTIAL	LEFT SIDE	N	PRESENT
803	0	1	PARTIAL	LEFT SIDE	Y	ABSENT
805	0	1	PARTIAL	SUPINE	N	PRESENT
806	0	1	PARTIAL	RIGHT SIDE	N	ABSENT
811	0	1	DISTURBED	DISTURBED	N	PRESENT

818	1	1	DISTURBED	DISTURBED	N	ABSENT
820	0	1	DISTURBED	DISTURBED	N	PRESENT
823	3	1	PARTIAL	LEFT SIDE	Y	ABSENT
830	0	1	PARTIAL	SUPINE	N	ABSENT
833	0	1	PARTIAL	SUPINE	N	ABSENT
838	1	1	FLEXED	LEFT SIDE	N	ABSENT
844	3	1	PARTIAL	RIGHT SIDE	N	PRESENT
846	1	1	PARTIAL	RIGHT SIDE	N	PRESENT
856	0	1	PARTIAL	SUPINE	Y	ABSENT
857	1	1	DISTURBED	DISTURBED	Y	PRESENT
861	0	1	FLEXED	RIGHT SIDE	Y	ABSENT
862	0	1	PARTIAL	SUPINE	Y	ABSENT
871	0	1	DISTURBED	DISTURBED	Y	ABSENT
873	3	1	DISTURBED	DISTURBED	Y	ABSENT
875	1	1	DISTURBED	DISTURBED	Y	ABSENT
876	3	1	DISTURBED	DISTURBED	Y	ABSENT
877	0	1	DISTURBED	DISTURBED	Y	ABSENT
878	1	1	DISTURBED	DISTURBED	Y	ABSENT
37	9	2	FLEXED	LEFT SIDE	N	PRESENT
51	8	2	PARTIAL	LEFT SIDE	N	ABSENT
85	10	2	FLEXED	LEFT SIDE	N	ABSENT
129	6	2	FLEXED	RIGHT SIDE	N	PRESENT
177	8	2	FLEXED	LEFT SIDE	N	PRESENT
254	10	2	FLEXED	RIGHT SIDE	Y	PRESENT
333	8	2	FLEXED	RIGHT SIDE	Y	ABSENT
355	12	2	FLEXED	PRONE	N	ABSENT
370	8	2	FLEXED	SUPINE	Y	PRESENT
371	7	2	FLEXED	SUPINE	Y	ABSENT
372		1	FLEXED	SUPINE	Y	ABSENT
388	8	2	DISTURBED	DISTURBED	N	ABSENT
405	9	2	FLEXED	SUPINE	N	ABSENT
412	7	2	FLEXED	RIGHT SIDE	N	PRESENT
416	7	2	FLEXED	SUPINE	N	PRESENT
426	7	2	FLEXED	RIGHT SIDE	N	ABSENT
428	11	2	FLEXED	LEFT SIDE	N	ABSENT
439	13	3	FLEXED	LEFT SIDE	N	PRESENT
458	12	2	FLEXED	RIGHT SIDE	N	ABSENT
479	11	2	FLEXED	PRONE	Y	PRESENT
583	6	2	FLEXED	LEFT SIDE	Y	ABSENT
623	5	2	FLEXED	LEFT SIDE	N	ABSENT
624	12	2	FLEXED	RIGHT SIDE	N	ABSENT
655	7	2	DISTURBED	DISTURBED	N	ABSENT
681		2	FLEXED	LEFT SIDE	N	PRESENT
683	7	2	PARTIAL	LEFT SIDE	N	ABSENT
720	11	2	PARTIAL	SUPINE	N	PRESENT
723	12	2	PARTIAL	LEFT SIDE	N	ABSENT

754	15	3	PARTIAL	RIGHT SIDE	N	PRESENT
757	5	2	DISTURBED	DISTURBED	N	PRESENT
781	5	2	PARTIAL	LEFT SIDE	Y	PRESENT
807			DISTURBED	DISTURBED	N	PRESENT
809	12	2	FLEXED	RIGHT SIDE	Y	ABSENT
828	6	2	DISTURBED	DISTURBED	N	ABSENT
834	9	2	PARTIAL	LEFT SIDE	N	ABSENT
879	11	2	DISTURBED	DISTURBED	Y	ABSENT
39	17	3	FLEXED	LEFT SIDE	N	PRESENT
53	14	3	DISTURBED	DISTURBED	N	ABSENT
80	14	3	FLEXED	SUPINE	N	PRESENT
255	17	3	FLEXED	LEFT SIDE	N	ABSENT
356	13	3	FLEXED	LEFT SIDE	N	ABSENT
361	15	3	FLEXED	RIGHT SIDE	N	ABSENT
381	17	3	FLEXED	SUPINE	N	ABSENT
395	13	3	PARTIAL	RIGHT SIDE	N	PRESENT
399	13	3	FLEXED	RIGHT SIDE	N	ABSENT
414	13	3	FLEXED	PRONE	N	ABSENT
433	15	3	PARTIAL	SUPINE	N	ABSENT
438	13	3	DISTURBED	DISTURBED	N	ABSENT
478	13	3	FLEXED	LEFT SIDE	N	ABSENT
483	13	3	FLEXED	SUPINE	N	ABSENT
500	13	3	FLEXED	PRONE	N	ABSENT
502	13	3	FLEXED	RIGHT SIDE	N	ABSENT
549	14	3	FLEXED	LEFT SIDE	N	ABSENT
563	14	3	FLEXED	LEFT SIDE	N	ABSENT
588	17	3	FLEXED	SUPINE	N	PRESENT
593	14	3	FLEXED	RIGHT SIDE	N	ABSENT
637	17	3	FLEXED	RIGHT SIDE	N	PRESENT
650	15	3	FLEXED	RIGHT SIDE	N	PRESENT
666	14	3	FLEXED	LEFT SIDE	N	ABSENT
688	13	3	FLEXED	RIGHT SIDE	N	ABSENT
706	16	3	FLEXED	RIGHT SIDE	N	PRESENT
718	13	3	DISTURBED	DISTURBED	Y	ABSENT
746	13	3	FLEXED	LEFT SIDE	N	PRESENT
760	17	3	DISTURBED	DISTURBED	Y	PRESENT
769	15	3	FLEXED	LEFT SIDE	N	PRESENT
798	13	3	PARTIAL	RIGHT SIDE	N	PRESENT
824	15	3	PARTIAL	SUPINE	N	PRESENT
832	15	3	PARTIAL	PRONE	N	ABSENT
839	14	3	PARTIAL	LEFT SIDE	N	ABSENT

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