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RESEARCH

Biocultural Taphonomies and Analysis of an Emerging Terminal Classic (750–900 CE) Maya Deathway

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Abstract

In bioarchaeology, funerary taphonomy and preservation become part of the biocultural narrative of the dead. We evaluate the role of these factors in reconstructing the identities of those buried in an emerging deathway, the ventrally placed legs flexed (VPLF) burial position, during the Terminal Classic (750–900/1000 CE) period at the Maya polity of Lower Dover in western Belize. The term "VPLF" describes a divergent burial practice which may have resulted from intentional binding prior to burial. In our analysis of VPLF burials ($n=12$), we use a two-step process to reconstruct the social identities and potential meaning of the burial pattern: (1) interpretation of the archaeological context based on excavation observations and biogeochemistry and (2) osteological analysis of curated individuals to reconstruct their biological profiles and post-mortem/post-excavation histories. Osteological analyses included age and sex estimation, paleopathological assessment of frailty and trauma, and skeletal modifications from cultural and taphonomic forces. Radiocarbon dating and ceramic analyses were used to date the burials. Stable and radiogenic isotopic analyses were applied to reconstruct diet and mobility for a subset of the VPLF burials. Our results show that individuals were buried in the VPLF position irrespective of age, sex, or social status, consistent with patterns at other Terminal Classic and Postclassic Maya sites, although VPLF interment may have been practiced earlier at Lower Dover. We hypothesize that the appearance of VPLF burials in the Terminal Classic period signified an ideological shift in light of emerging social and environmental pressures in the region.

Keywords Funerary taphonomy · Atypical mortuary patterns · Classic Maya · Upper Belize Valley · Bioarchaeology

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Introduction

It is generally recognized in anthropology that human bodies are biocultural entities shaped by mutually acting forces, which can be biological, environmental, social, cultural, political, or economic in nature. Applications of life history theory in biological and ecological anthropology, for example, have demonstrated that human adaptations and health are the byproducts of our own lived experiences as well as our evolutionary histories, both contributing to our genetic and physical variation, and that cultural and environmental forces contribute to these processes (Agarwal, 2012; Barker, 2007; Barker & Osmond, 1986; Dean, 2006; Jones, 2009; Newham & Naji, 2022; Scherer, 2015; Smith & Alemseged, 2013). Death is also a biocultural force influencing the social lives of human bodies, which arguably continues long after death as the living continue to interact with the dead in any number of ways (McAnany, 2013; Parker Pearson, 1982, 1993, 1999). The disposal, veneration, appropriation, scientific recovery, and analysis of the dead inadvertently extend the postmortem narrative of the once-living through funerary and other taphonomic processes. Understanding these processes expands our knowledge about both the deceased individual and the living, whose actions have impacted the agency of the remains under study.

Taphonomy, or the changes in biological remains from time of death until discovery, recovery, and analysis, impacts interpretation of ancient funerary practices or "deathways" and cultural modifications that occur long after death (Duday, 2009; Knüsel & Robb, 2016; Pokines & Baker, 2022). Within the realm of bioarchaeology, taphonomic processes are often regarded as destructive forces that impede our ability to reconstruct the identities and lifeways of those we study and, on an aggregate level, yield useful information about skeletal age distributions used to understand demographic and health patterns of past communities (Gordon & Buikstra, 1981; Hoppa *et al.*, 2002; Kelmelis & Price, 2022; Knüsel & Robb, 2016; Waldron, 1987, 2007; Wood *et al.*, 1992). However, with careful field documentation, taphonomic observations can potentially offer valuable insights into the internal and external processes that contributed to human decomposition and help reconstruct the mortuary practices of past populations (Duday, 2009; Nilsson Stutz, 2006). This approach, "l'anthropologie du terrain" or "archaeothanatology," was developed in the 1980s within the scope of French rescue archaeology (Duday, 2009) and integrates methods from archaeology, biological anthropology, and forensic medicine to reconstruct the death practices of past populations through in-depth osteological, taphonomic, and archaeological analyses. As such, it is important that those who are engaged in field work are trained in osteological methods in identification and recovery, taphonomic processes, and archaeological understanding of the burial context (Duday, 2009: 6).

In the USA, however, there are disciplinary lines of training and field objectives that separate archaeologists and bioanthropologists. Archaeologists may lack osteological training and prioritize architecture and other material remains over bones. Biological anthropologists, on the other hand, sometimes lack archaeological field training or are not well versed in architectural form and function. While the past century of archaeological work often lacked the detail needed for archaeothanatological analysis, recent efforts aim to integrate this approach to address these gaps and improve future studies (Nilsson Stutz, 2003, 2006). Additionally, technological advancements in bioarchaeology, and archaeology more generally, now provide rich data on diet, migration, health, and chronology that can further elucidate past mortuary practices when we also account for taphonomic factors. To more fully understand the patterns resulting from funerary practices and the systems that motivated them, we advocate using a biocultural approach that integrates multiple lines of evidence from the remains, their contexts, and those derived from ethnographic and archival sources to understand how taphonomic forces and mortuary patterns contribute to the reconstruction of past individuals' identities (Agarwal *et al*., 2011; Green, 2016).

To demonstrate how funerary taphonomy and preservation become intertwined with what happens *after* excavation and what that means for reconstructions of past identities, we focus on reconstructive analyses of Late (600–800 CE) and Terminal Classic (800–900 CE) ventrally placed, legs flexed (VPLF) burials of ancient Maya individuals interred at the Lower Dover polity in the eastern Maya lowlands (Table 1; Fig. 1). The term "VPLF" is used to describe the atypical Terminal Classic and Postclassic Maya burial practice involving the positioning of individuals in a prone position with knees fully flexed so that the feet rest on the posterior aspect of the hips (see Figs. 1 and 2) (Donis, 2013; Izzo, 2018; Wrobel & Graham, 2015). This study poses new questions about the timing and nature of this burial practice and the underlying identities of those buried in this manner: did the VPLF burial position emerge in this region as a distinct burial tradition? Was VPLF burial treatment afforded to a specific segment of society, related to a particular age, kinship, or status group? Were individuals interred in this position potentially as a way of indicating their status as migrants, or, perhaps, captured or sacrificial individuals?

Table 1 Chronology for the Upper Belize River Valley based on published radiocarbon dating and ceramic analysis (Ebert *et al*., 2017; Gifford, 1976; Hoggarth *et al*., 2014; Kosakowsky, 2012; Walden, 2021; Willey *et al*., 1965)

Time period	Date range	Barton Ramie ceramic phases
Late Postclassic	1290–1420 CE	New Town
Early Postclassic	900/1000–1290 CE	
Terminal Classic	750/800–900/1000[a] CE	Spanish Lookout II
Late Classic	700–750/800 CE	Spanish Lookout I
Early Late Classic	600–700 CE	Tiger Run
Early Classic	250/300–600 CE	Hermitage
Terminal Preclassic	150–250/300 CE	Mount Hope/Floral Park
Late Preclassic	300 BCE–150 CE	Barton Creek
Middle Preclassic	900–300 BCE	Jenney Creek
Late Early Preclassic	1200–900 BCE	Cunil (Cahal Pech)

[a]Terminal Classic in the Upper Belize River Valley begins around 750 CE, but this seemingly does not start at Lower Dover until 800 CE

Fig. 1 Photograph of SG 1 Burial 3 in VPLF position (adapted from Walden, 2021)

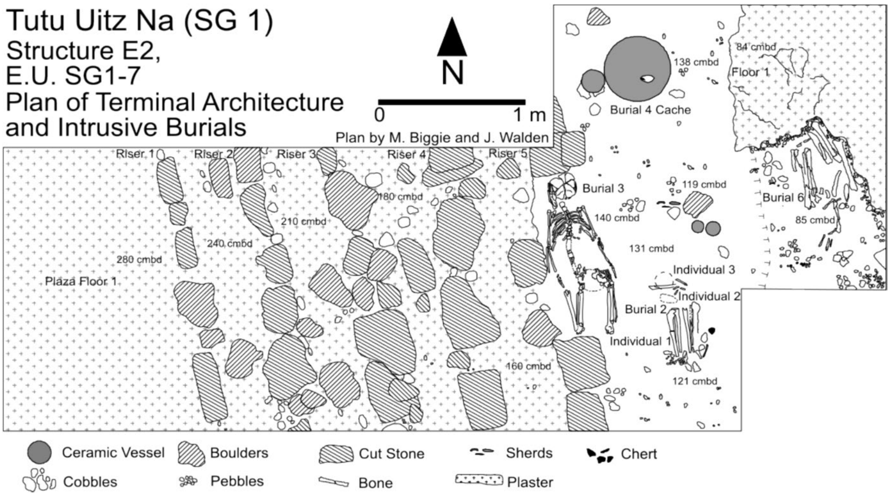

Fig. 2 Plan of SG 1 Burial 3 in VPLF position (adapted from Walden, 2021)

Conversely, is the placement of the lower legs flexed over the pelvis the result of natural decomposition of the body in the grave and/or taphonomic forces? These questions are essential for fully understanding the nature of VPLF burials and the changing mortuary practices of the ancient Maya, especially during a time of societal stress at the end of the Classic period (Hoggarth *et al.*, 2017; Kennett *et al.*, 2012; Turner & Sabloff, 2012). Previous work by Wrobel and Graham (2015) highlight some of these possibilities, including a potential genetic distinction of VPLF individuals or relationship with the emergent Postclassic Buk ceramic tradition. We cannot address the biodistance possibility at this time, and the individuals placed in the VPLF position at Lower Dover all date to the Late to Terminal Classic period and as such are accompanied by a fairly standard Late and Terminal Classic (Spanish Lookout I–II) ceramic assemblage (Gifford, 1976).

Within the context of this study, the term "atypical" does not directly translate to socio-culturally constructed categories of deviancy, since the latter term frequently implies negative and often problematic connotations about the nature of the burial and their identity in life (Aspöck, 2009, Scott *et al.*, 2020). Generally, an atypical burial is one with mortuary treatments that differ from those considered characteristic for a given population (Aspöck, 2009; Betsinger & Scott, 2020; Betsinger *et al.*, 2019; Murphy, 2008; Scott *et al.*, 2020; Tsaliki, 2008). How atypical burials are defined within a specific population varies by context since archaeologists categorize these interments based on observations of the deceased and our interpretation of the relationship between the living and the dead (Binford, 1972; Saxe, 1970). These categorizations may not directly reflect the person's status in life, however, as the dead do not bury themselves (Parker Pearson, 1993). As such, our exploration of the VPLF burials is embedded in a discussion about the context of these and contemporaneous Maya burial practices in the Upper Belize River Valley of west-central Belize. This study includes multiple lines of evidence, including osteological, geochemical, archival, and iconographic data, to reconstruct their identities and understand the VPLF mortuary treatment.

In the Upper Belize River Valley, the overarching trend in burial placement has individuals laid in an extended position with the head to the south; minor variation in body position is also observed in burials in western Belize and the easternmost Peten (Green, 2016; Hoggarth *et al.*, 2022; Novotny, 2015; Schwake, 2008; Welsh, 1988; Willey *et al.*, 1965). This trend was established during the Late/Terminal Preclassic, and crosscuts demographic categories (*e.g.,* age, sex, wealth, status; Willey *et al.*, 1965). While the extended, head to the south orientation was predominant throughout most of the Classic period, a range of other burial placements existed. For example, approximately 25% of the Early Classic burials at the Barton Ramie districts of Lower Dover were buried in seated or flexed positions (Hoggarth *et al.*, 2022: 226). The VPLF burial pattern, however, is uncommon and occurs at a small number of sites, which has led to the predominant hypothesis that these individuals are "atypical" in some way, either because of some underlying demographic factor (*e.g.,* age, sex/gender, kinship, migrant) or some other ascribed status based on their lived experience (*e.g.,* social or wealth status, health experiences, captive or sacrifice) (Graham, 2004; Graham *et al.*, 2013; Walden, 2021; Wrobel & Graham, 2015).

Among the Lower Dover burials, the extended, head to the south position is the most common from the Late Preclassic to the Terminal Classic, although other forms of bodily positioning wax and wane in frequency over time, examples include the aforementioned seated position and the VPLF position (Freiwald *et al.*, 2014;

Hoggarth *et al*., 2022; Walden, 2021; Willey *et al*., 1965). Archaeologists have focused on the VPLF position because of the peculiarity of the physical positioning and its relatively late appearance during the Late/Terminal Classic period. The irregular placement of the lower legs flexed and the feet over the pelvis may have resulted from intentional binding prior to deposition of the body in the grave (Graham *et al*., 2013: 174; Tiesler, 2007:18–22; Walden, 2021: 160; Watkins *et al*., 2017: 155). The iconographic record provides indirect evidence of binding practices, typically of captives or sacrificial individuals' who are illustrated in a prone position with their arms and legs bound behind their back (Earley, 2023; Helmke *et al*., 2005; Marcus, 1993). While the iconography suggests such binding practices existed, excavations have yet to produce evidence of binding or wrapping, likely because such objects were made of biodegradable material and decomposed quickly after burial (Bye, 2020; Fitzsimmons, 2009: 76–80; Green Mink & Bye, 2020: 281). In the absence of direct evidence of binding, there are other explanations for the maintained positioning of the flexed legs and feet over the pelvis after the corpse had decomposed (*e.g.,* constriction from fill, stabilizing wall effects, other taphonomic variables) (Harris & Tayles, 2012; Nilsson Stutz, 2006), although these have yet to be fully explored within the context of VPLF burials. The presence or absence of binding in VPLF burials bears importance for the continuing discussion around Maya death practices involving captive or sacrificial individuals, including questions about the movement of those individuals before death (Graham, 2019, 2020; Chinchilla Mazariegos *et al*., 2015; Price *et al*., 2019; Tiesler, 2007; Tiesler *et al*., 2007; Schwartz, 2017; Serafin & Peraza Lope, 2007; Storey, 2014; Vail & Hernández, 2007). Therefore, it is important that we explore other aspects of VPLF burial identity to discern possible underlying meanings in mortuary treatment.

Archaeologists have observed that VPLF burials primarily appear towards the end of the Classic period and into the Postclassic period in the eastern lowlands, a detail that may be significant in identifying who these individuals were. To our knowledge, no VPLF burials have been reported in the Peten, western lowlands, northern lowlands, or southern highlands, which adds to the curiosity around these particular burials and their emergence within the eastern lowlands. Prior to this study, the earliest documented Terminal Classic VPLF burials are at the site of Marco Gonzalez on Ambergris Caye, although these have yet to be radiocarbon dated (Graham & Howie, 2021; Graham & Pendergast, 1989; Kratimenos *et al*., 2023). Later VPLF burials dating to the Early Postclassic are found at Lamanai and Chau Hiix in Belize (Andres & Pyburn, 2004; Donis, 2013), and Late Postclassic instances are also known from San Pedro on Ambergris Caye (Wrobel & Graham, 2015). In this study, we analyze and document VPLF burials radiocarbon dated to the Terminal Classic, in addition to some potentially earlier burials dated using ceramic chronologies, from the Late Classic polity of Lower Dover (Wrobel & Graham, 2015; Hoggarth *et al*., 2022; Walden, 2021).

We analyzed 12 individuals who were placed in the VPLF position in various residential contexts at Lower Dover (Table 2). Our analysis of the Lower Dover VPLF burials is based on a two-step process to holistically reconstruct this past deathway: (1) interpretation of the archaeological context of the individuals based on observations during excavation and (2) osteological and biogeochemical

Table 2 Summary of VPLF burials from Lower Dover Polity. Status assignments based on Walden, 2021 and Walden *et al*., 2019, District (settlement cluster) assignments based on Walden, 2021 and Walden *et al*., 2023a

Burial #	District	Status of the context	Date	Ceramic complex	Excavation date	Curation	Reference
BR-82 Burial 1	Island	Low Status Commoner	Late Classic	Spanish Lookout	1956	Unknown	Willey et al., 1965: 202
BR-123 Burial 7	Middle River	High Status Commoner	Late Classic	Spanish Lookout	1955	PMAE	Willey et al., 1965: 114–118
BR-123 Burial 9	Middle River	High Status Commoner	Late Classic	Spanish Lookout	1955	PMAE	Willey et al., 1965: 114–118
BR-123 Burial 17	Middle River	High Status Commoner	Late Classic	Spanish Lookout	1955	PMAE	Willey et al., 1965: 119
BR-123 Burial 20	Middle River	High Status Commoner	Late Preclassic	Floral Park to Early Hermitage	1955	PMAE	Willey et al., 1965: 101–121
BR-123 Burial 23	Middle River	High Status Commoner	Early Late Classic	Spanish Lookout	1955	PMAE	Willey et al., 1965: 121
BR-135 Burial 1	Middle River	Low Status Commoner	Late Classic	Spanish Lookout	1955	PMAE	Willey et al., 1965: 230–231
BR-167 Burial 2	Oxbow	Low Status Commoner	Late Classic	Spanish Lookout	1954	Unknown	Willey et al., 1965: 241–242
BR-167 Burial 4	Oxbow	Low Status Commoner	Late Classic	Spanish Lookout	1954	Unknown	Willey et al., 1965: 241–242
CT2 Burial 1	Lower Dover	Apical elite	Late-Terminal Classic	Spanish Lookout	2016	BVAR Project	Watkins et al., 2017
SG 1 Burial 2 Individual 1	Tutu Uitz Na	Intermediate Elite	Terminal Classic (cal 770–880 CE)	Spanish Lookout	2017	BVAR Project	Walden, 2021
SG 1 Burial 3	Tutu Uitz Na	Intermediate Elite	Terminal Classic (cal 770–880 CE)	Spanish Lookout	2017	BVAR Project	Walden, 2021

analysis of VPLF individuals in curated collections to reconstruct their biological profiles and post-mortem/post-excavation history. This approach is often employed in forensic archaeology, which has a strong emphasis on using methods from archaeology, taphonomy, and knowledge of postmortem interval (PMI) to reconstruct the series of events from death to discovery in medicolegal contexts, including disentangling evidence of cause of death from taphonomic alteration on the bones (Pokines & Baker, 2022). As mentioned above, a similar approach in bioarchaeology has been referred to as archaeothanatology or "l'anthropologie du terrain" wherein the main difference is that archaeological techniques along with knowledge about taphonomy and decomposition of the corpse are used to reconstruct details about mortuary practices and treatment of the dead (Duday, 2009; Knüsel *et al.*, 2021, Gligor, 2014). The burial feature is the main dynamic entity under study, where the architecture and surrounding material accompaniments are present *because* of the deceased individual (Duday, 2009).

In both forensic and bioarchaeological circumstances, the most crucial data are mutually found and lost during excavation, which is why careful collection of details are essential for accurate reconstruction. Such details include recording the precise position of each element within the grave feature in terms of depth and relative position to other skeletal elements, grave architecture, material remains, and any natural features which may have existed before or after deposition (*e.g.,* tree roots, animal burrows). This level of detail enables a thorough reconstruction of mortuary practices and the role of taphonomic forces in the appearance of the burial, including the nature of the burial (*e.g.,* primary or secondary burial), the grave's microenvironment where the decomposition process took place (*e.g.,* filled space or void), and the role of mortuary behaviors versus taphonomic forces on the dissociation or stabilization of skeletal elements once decomposition is complete (*e.g.,* wrapping, burial containers, seated burials) (Baitzel, 2019; Duday, 2009; Harris & Tayles, 2012; Nilsson Stutz, 2006).

Pertinent to our analysis, taphonomic assessment of the burial context with the remains *in situ* can elucidate whether they were bound, wrapped, or not (Nilsson Stutz & Larsson, 2016), or if they decomposed in an open space or were compressed by soil (Duday & Guillon, 2006). Ideally, these data should be collected during the excavation process; however, this level of detail is not always possible since this approach is time consuming to do in the field where circumstances may not always permit. Furthermore, the original excavation may not have included the level of detail necessary for a full archaeothanatological analysis after the fact. Such is the case with many excavations dating to the early and mid-twentieth century. Remains from these excavations are often now curated in museum collections, where records from the excavation of the burials are either not present or partially incomplete. However, surviving drawings, field notes, and photographs from the original excavations curated in archives along with new data from osteological and geochemical analyses of the curated VPLF burials may be sufficient to provide a more informed holistic interpretation of the remains (Harris & Tayles, 2012; Knüsel & Robb, 2016; Nilsson Stutz, 2006).

Materials and Methods

Sample Curation and Archaeological Context

Lower Dover was one of several medium-sized polities in the Upper Belize Valley and was located seven kilometers east of Baking Pot and four kilometers west of Blackman Eddy (Guerra & Awe, 2017; Helmke & Awe, 2012). Late Classic Lower Dover covered ~ 16 km^2 and housed ~ 2500 people (Walden *et al*., 2019, 2023b, 2023c) (Fig. 3). For this study, 12 individuals interred in the VPLF position have been identified across the Lower Dover polity, including at the royal palace (Watkins *et al*., 2017), at the minor center of Tutu Uitz Na (Biggie *et al*., 2019; Walden, 2021; Walden *et al*., 2018), and in commoner residences in the northern districts of Barton Ramie (Willey *et al*., 1965) (Table 2). Archaeological investigation in the Lower Dover polity began in the 1950s with Willey and colleagues' (1965) pioneering settlement project at Barton Ramie, an area which comprised several districts within the larger polity (Walden, 2021). Over three decades later, the polity capital of Lower Dover was identified on the south bank of the Belize River one kilometer west of the modern village of Unitedville, Cayo District (Fig. 3) (Castelhano & Reeder, 1996). Excavation of the epicenter undertaken by Guerra (2021) as part of his doctoral research on the Belize Valley Archaeological Reconnaissance (BVAR) Project revealed that it was constructed during the Late-Terminal Classic (Guerra & Awe, 2017; Walden *et al*., 2023a; Wölfel *et al*., 2009).

The Lower Dover center was surrounded by districts of commoner settlement focused around intermediate elite minor centers at Barton Ramie, Floral Park, and Tutu Uitz Na (Walden *et al*., 2023a; Walden *et al*., 2023b). These districts were the focus of settlement survey, household excavations, and collections research as part of Walden's (2021) dissertation work. Investigation revealed that the districts and their minor centers formed in the Middle Preclassic (900–300 BCE) (Biggie *et al*., 2023; Walden, 2021; Walden *et al*., 2024). A clear status hierarchy is evident within the settlement hierarchy at Lower Dover, comprising apical elite royals based at the civic-ceremonial epicenter of Lower Dover, intermediate elites living either in large residential plazuelas in the epicenter or minor centers in the hinterland, high-status commoners living in patio groups of three to five large mounds around a central patio, and low-status commoners living in smaller house groups of a single or sometimes two mounds (Walden *et al*., 2019, 2023a, b, c).

Following Hoggarth (2012), architecture was used to assign status and portable wealth items associated with different fill episodes were employed to evaluate the changing affluence of the household. Previous studies have observed variability in grave accompaniments and architecture (*e.g.,* cist, tomb, or simple grave), which roughly correlate with status based on settlement size and location (Walden *et al*., 2019; Webster, 1997; Welsh, 1988; Willey *et al*., 1965). The ancient Maya buried at least some of their dead under their house floors in residential architecture; individuals would be interred sequentially over time as residential architecture was expanded and platforms built up (Haviland, 1988; Tourtellot, 1988; Webster,

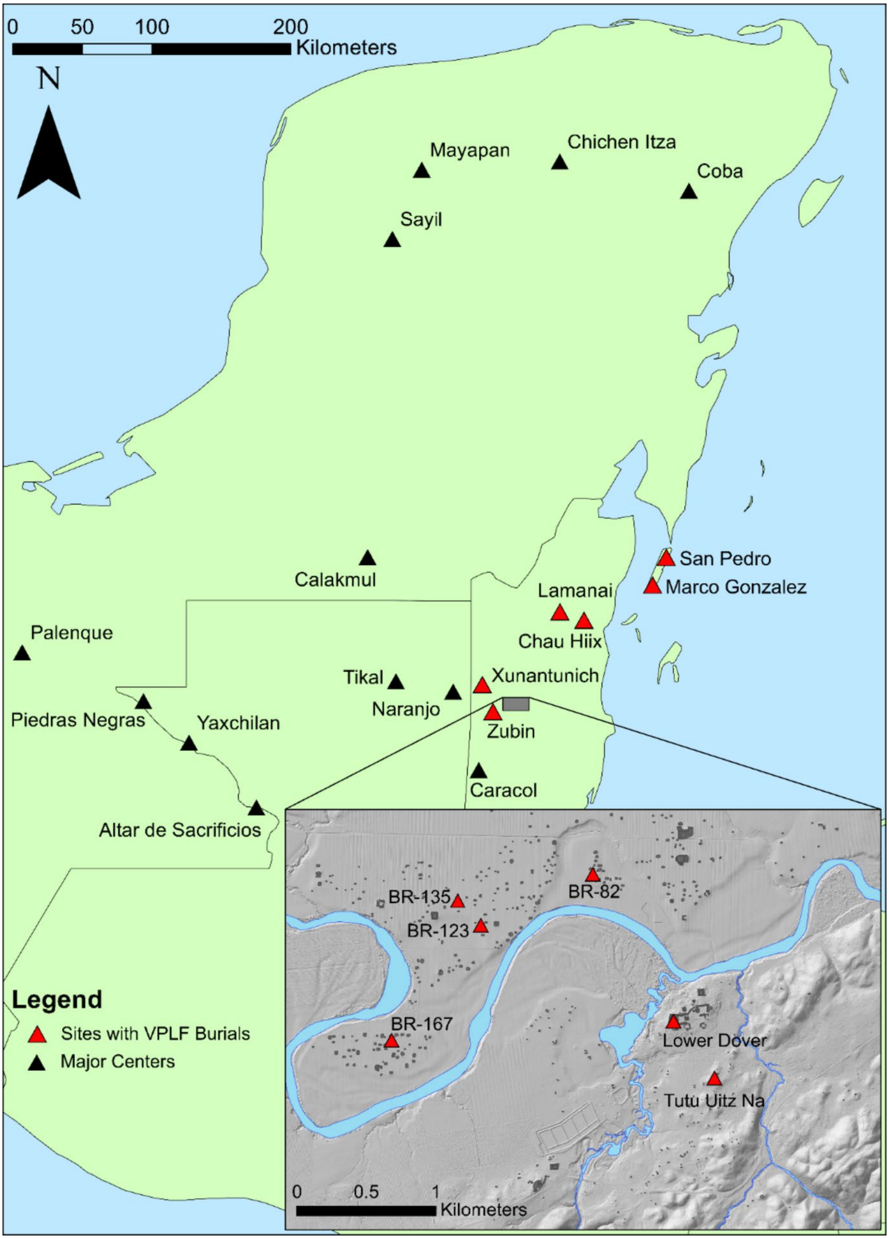

Fig. 3 Map of the Maya lowlands with sites with VPLFs highlighted with Belize River Valley (BRV) inset with the Belize River and sites with VPLFs highlighted (map courtesy of Walden)

1997). Generally, individuals placed in commoner households were interred in less architecturally elaborate graves (simple graves, cists, or occasionally crypts placed within in architectural fill), with less lavish grave assemblages (ceramics, lithics, shell jewelry, and occasionally jade). Individuals interred at intermediate elite centers generally had more substantial graves with more affluent grave assemblages. Lastly, individuals interred in monumental structures and temples have the most substantial graves (cists, crypts, and tombs) with the most affluent burial assemblages (items bearing hieroglyphics, polychrome ceramics, jade masks, and other sumptuary items) (Audet & Awe, 2004; Awe & Zender, 2016; Awe *et al.*, 2017a; Colas *et al.*, 2002; Conlon & Powis, 2004; Freiwald *et al.*, 2014; Green, 2016; Helmke *et al.*, 2008; Novotny, 2015; Walden, 2021; Welsh, 1988; Willey *et al.*, 1965; Yaeger *et al.*, 2015).

VPLF burials from Barton Ramie are curated by the Harvard Peabody Museum of Archaeology and Ethnology (PMAE) ($n=9$), and those from the Lower Dover epicenter and Tutu Uitz Na are curated by the BVAR Project ($n=3$). The 12 VPLF burials form 9% of the overall Late-Terminal Classic burial assemblage at Lower Dover (128 individuals; see Bachy, 2021). Of these 128 individuals, 77 (60%) are placed extended prone or supine with the head to south (the normative practice in the region), 26 (20%) are placed seated or in bundles, caches, or other secondary contexts, and the other 13 are undetermined (10%) (Bachy, 2021; Walden, 2021; Willey *et al.*, 1965). These burials, and the VPLF burial tradition at Lower Dover, broadly showcase a wide range of variable taphonomic issues, including evidence of root etching and invasion, soil corrosion and staining, cracking from drying waterlogged bone, and termite damage. Following the Terminal Classic depopulation of the polity, the Lower Dover epicenter and surrounding settlement were engulfed in verdant tropical forest for at least several centuries, which left its own taphonomic marks on household architecture and the individuals placed within these contexts. In more recent centuries, broad-scale taphonomic disturbances were more localized to specific parts of the polity. At the northern districts of Barton Ramie, sixty years of mechanized agricultural plowing has removed Classic period architecture in its entirety, meaning that any remaining VPLF burials are entirely lost to post-depositional destruction (Walden *et al.*, 2020). Fortunately, between 1953 and 1956, the extensive excavations of Willey and colleague's (1965) at Barton Ramie recovered nine individuals interred in this position. These individuals along with the rest of the osteological assemblage have been carefully curated by the PMAE for over seventy years.

From their initial discovery, excavation, and later curation, these individuals have been subject to a completely different series of taphonomic processes compared with their remaining peers at Barton Ramie, who are now removed from the archaeological record entirely. While the individuals curated by the PMAE were saved from certain destruction, they were subject to mid-twentieth-century curatorial practices, which left their own taphonomic signatures (Freiwald, 2019; Schultz, 2012). Willey and colleagues' (1965) seminal report includes summary descriptions of the burials, osteological assessments by physical anthropologists Orville Elliott and Hermann Bleibtreu, lists of grave accompaniments, and the associated domestic architectural phases. While the scale of the original excavations and the detailed documentation provide a substantive window into the VPLF burial tradition at Barton Ramie, we are now in a better position to analyze and understand the lives of the individuals interred in this position given advances in osteology and bioarchaeology and the development of interdisciplinary methods and theoretical approaches. In contrast to the mechanized cultivation of the alluvial soils at Barton Ramie, the shallower soils on the southern bank are subject to cattle pasturing (Walden, 2021). These practices leave a far less dramatic taphonomic signature on Classic Maya settlement and the individuals interred within household architecture than mechanized agriculture. Instead, other post-depositional factors, most notably looting, have left an indelible taphonomic mark on Classic Maya funerary assemblages. Most of the monumental eastern shrine structures south of the Belize River have been extensively looted, and this is true of Tutu Uitz Na, which was trenched by looters at some point in the last fifty years. Ultimately, despite these taphonomic challenges, we are now well situated to investigate the VPLF tradition at Lower Dover and begin to question why certain individuals were placed in this position. The excavation plan maps, photographs, and burial descriptions by Willey and colleagues (1965) were used to aid in our archaeothanatological reconstruction of the burial deposits, along with more recent data from BVAR excavations (Biggie *et al.*, 2019; Green Mink & Bye, 2020; Watkins *et al.*, 2017).

Temporal Assignments

We directly dated bone collagen from two individuals placed in the VPLF position at Tutu Uitz Na using AMS ^{14}C radiocarbon dating (Walden, 2021). An extensive program of radiocarbon dating of charcoal and faunal remains was also conducted at Lower Dover to validate the well-established local ceramic chronology (Gifford, 1976; Guerra, 2021; Walden, 2021). The ceramic typology developed by Gifford (1976) has been consistently updated and refined over the last fifty years and is reliable for dating archaeological contexts (Table 1) (Aimers, 2002, 2004, 2013; Chase & Chase, 2008; Culbert & Kosakowsky, 2019; Hammond, 1975; Hoggarth *et al.*, 2014; Kosakowsky, 2012; Kosakowsky & Robin, 2010; LeCount, 1999, 2004; Lincoln, 1985; Pring, 2000; Sabloff, 1975). The division of the overarching Spanish Lookout (700–900 CE) phase into two facets is central to this study (Gifford, 1976: 226). Spanish Lookout I (Early Facet, 700–800 CE) comprises the standard Late Classic ceramic assemblage while Spanish Lookout II (Late Facet, 800–900 CE) represents the Terminal Classic assemblage, which includes most Spanish Lookout I types and also diagnostic indicators of the Terminal Classic period including Cayo Unslipped: Alexanders Variety (with the pie crust rim; Kosakowsky, 2012: 58–60), Daylight Orange (Awe & Helmke, 2007), incurving Mount Maloney bowls (LeCount, 1996), Miseria Appliquéd *incensarios* (Sabloff, 1975), outcurving Roaring Creek Red bowl rims (Aimers *et al.*, 2019), and molded-carved vessels (Helmke & Reents-Budet, 2008; Ting *et al.*, 2014). Future radiocarbon work will further refine ceramic date ranges and individuals interred in the VPLF position.

Stable and Radiogenic Isotope Analyses

Stable carbon ($\delta^{13}C$) and nitrogen ($\delta^{15}N$) isotope measurements from human bone collagen were used to reconstruct diet for a subsample of the VPLF burials ($n=4$).

Carbon isotope values ($\delta^{13}C$) vary based on the isotopic composition of plant food proteins (DeNiro & Epstein, 1978). Plant $\delta^{13}C$ values are determined by photosynthetic pathways used by C_3 (Calvin-Benson), C_4 (Hatch-Slack), and CAM (crassulacean acid metabolism) species (Smith & Epstein, 1971). Human bone collagen possesses $\delta^{13}C$ values of approximately –22 ± 1‰ for a diet composed entirely of C_3 plants (Tykot, 2002). Previous studies in the Maya lowlands document average bone collagen $\delta^{13}C$ values from approximately − 12.0 to − 8.0‰ for the Classic period, however, reflecting primarily C_4 dietary protein (*i.e.*, maize-based diet) (Ebert *et al.*, 2021; Gerry, 1993; Somerville *et al.*, 2013; White, 1999). Nitrogen isotope values ($\delta^{15}N$) in bone collagen are associated with protein consumption (DeNiro & Epstein, 1981) and vary + 3–5‰ based on the trophic position of the plants or animals consumed (Bocherens & Drucker, 2003). Human bone collagen $\delta^{15}N$ values in the upper Belize River Valley during this time period range from ~ + 7 to + 12‰ (Ebert *et al.*, 2021).

Strontium ($^{87}Sr/^{86}Sr$) isotope values were included to address whether some VPLF burials were migrants, as reported elsewhere (Howie *et al.*, 2010). Isotopic variation serves as a proxy for human mobility in the Maya region; ratios of $^{87}Sr/^{86}Sr$ in human tooth enamel reflect those of the underlying geology (Bentley, 2006; Hodell *et al.*, 2004; Price *et al.*, 2010). Migration from isotopically distinct regions is inferred when $^{87}Sr/^{86}Sr$ values in tooth enamel, which forms during infancy and childhood, differ from the environmental values of the burial location. The proximity of the Belize River Valley to the Maya Mountains results in a mosaic of values that allow population movement to be observable over relatively short distances (Freiwald, 2018, 2020; Green, 2016). Analyses of $^{87}Sr/^{86}Sr$ were conducted on dental enamel extracted from the molars of two VPLF burials (Freiwald, 2021). The sampled teeth were documented using a digital microscope camera, dental metrics were recorded, and dental impressions were made to produce casts of the tooth crowns (Freiwald, 2011: 106–108).

Osteological Methods

Osteological analyses of 12 VPLF burials were conducted to reconstruct the life histories and funerary taphonomies of individuals placed in the VPLF position (Table 2). Nine of the 12 VPLF burials were analyzed within a laboratory environment following the osteological methods outlined below. Three other individuals (BR-82 Burial 1 and BR-167 Burials 2 and 4) were not available for analysis, and consequently, osteological observations for these individuals are based on Willey and colleagues' (1965) analysis and archival research.

Age Estimation

In an ideally preserved skeletal sample, a consistent approach to age estimation — preferably one that accounts for issues of age mimicry, includes multiple age indicators, and reports statistical probabilities and errors — would be used across all individuals of a particular age group. Many of the individuals included in this study (a) lacked the necessary elements to estimate age with this or other methods, (b) the necessary elements were taphonomically altered such that confident scores could not be derived, and/or (c) necessary elements were altered due to curation reconstruction (*i.e.*, cranial bones adhered together), inhibiting accurate estimation of age-related features. Decisions about what age estimation methods were used for each respective burial were based on the level of preservation and completeness of skeletal elements consistent with age-related changes. As such, adult age estimation for individuals was conducted using a suite of approaches based on the level of preservation and completeness of each burial (Boldsen *et al.*, 2002; Brooks & Suchey, 1990; Buikstra & Ubelaker, 1994; Getz *et al.*, 2017; Milner & Boldsen, 2012). For nonadult individuals (*i.e.*, those individuals for whom all epiphyses have not yet fused), age was estimated based on dental development and eruption, as well as epiphyseal union (AlQahtani *et al.*, 2010; Buikstra & Ubelaker, 1994; Schaefer *et al.*, 2009).

Sex Estimation

Adult skeletons were examined for sexually dimorphic features of the pelvis and cranium since these are the most reliable and accurate features for sex estimation (Buikstra & Ubelaker, 1994). Scored pelvic and cranial traits were analyzed using the morphoPASSE online software program that uses random forest modeling (Klales, 2020). In some circumstances, the circumference of the femoral head was measured to provide a metric estimate for sex. Based on resulting scores from morphoPASSE and metric approaches, individuals were assigned a numerical value estimate based on a 1–5 scale with 1 being "probable female," 2 being "possible female," 3 being "intermediate," 4 being "possible male," and 5 being "probable male"; nonadults were described as indeterminate. We recognize that skeletal sex estimation does not accurately represent the entire continuum of human sexual variation, nor does it represent current and past cultural representations of gender identity and is, thus, limiting in reconstructing full dimensions of sex and gender-based identity.

Paleopathological and Cultural Alteration Analyses

Skeletal and dental changes associated with metabolic stress, infection, and trauma were scored for each individual to determine their underlying frailty and lived experiences prior to death (Buikstra & Ubelaker, 1994; DeWitte & Wood, 2008). These include those that are commonly characterized as non-specific (referring to skeletal lesions whose cause is indistinguishable from lesions with a different underlying cause) and pathologies of metabolic stress and infection that are linked to individual frailty (susceptibility to disease and death) (Wood *et al.*, 1992). Metabolic stress can disrupt the normal processes of bone production and bone destruction leading to abnormal proliferation or destruction of bone (Ortner, 2003). Two such indicators, porotic hyperostosis (PH) and cribra orbitalia (CO), are often associated with childhood episodes of metabolic stress, generally from nutritional deficiency, most commonly anemia, leading to the expansion of the diploë of the bones of the cranial vault (porotic hyperostosis) and the anterolateral portion of the orbital roof (cribra orbitalia) (Brickley, 2018). These childhood indicators can be maintained into adulthood and have been identified in Mesoamerican pre-contact skeletons as indicators of nutritional distress during formative years of development (Martin & Goodman, 2002). Lesions are scored as "present" if there is at least one square centimeter of porosity consistent with PH and CO on either the cranial vault or the orbital roof of the frontal bone.

Linear enamel hypoplasia (LEH), another childhood indictor of metabolic stress, is a macroscopic tooth enamel defect that appears as a horizontal line or ring on the labial enamel surface of permanent teeth caused by disruptions in the metabolism of ameloblasts (Goodman & Rose, 1990). LEHs typically develop in childhood and do not remodel in adulthood, which amplifies their suitability as indicators of surviving childhood stress. The presence and number of LEH on the labial surfaces of mandibular and maxillary anterior teeth, specifically canines, were recorded on teeth with little to minor level of dental attrition, cultural modifications (*e.g.,* inlays or filing), and taphonomic alterations that may obscure the appearance of LEH. Specifically, if the observer could visually and/or manually identify the LEH by running their fingernail over the surface, the indicator was marked as "present."

Dental pathologies that are indicative of oral health, including dental caries, abscesses, calculus, and periodontal disease, were recorded as present or absent. Dental caries are one of the most common dental pathologies in archaeological samples, particularly from those agricultural populations that subsisted on carbohydrate-rich foodstuffs like maize (Buikstra & Ubelaker, 1994; Ortner, 2003). As such, they are generally informative about dietary and subsistence behavior and oral health. The Classic Maya, despite having a diverse diet in the Early Classic period, grew to have a heavy reliance on corn as populations increased into the Late Classic period, which is also evidenced in their religious beliefs and practices (Green, 2016; Ebert *et al*., 2021; Rand *et al*., 2020; Freiwald, 2011; Freiwald, 2018). In this population, caries tend to be concentrated in posterior teeth at the cementum enamel junction (CEJ), where food particles accumulate and are difficult to remove, therefore leading to large caries on the mesial and distal surfaces at the CEJ. They can also appear on the occlusal surfaces of posterior teeth, which are more complex than anterior teeth. The presence and location of caries were noted using criteria described by Buikstra and Ubelaker (1994). Abscesses can form because of inflammation of the tooth pulp chamber of a tooth that has experienced severe attrition or dental caries and appear as drainage channels from the root apex in the alveolar bone (Buikstra & Ubelaker, 1994). Abscesses in the alveolar bone were scored as "present" if a channel was visible adjacent to a tooth root on the lingual or labial/buccal surface of the alveolar bone.

Dental calculus also tends to accompany other dental pathologies since the calcification of dental plaque is a strong indicator of a diet and oral health (Belanich, 2020; Smith & Warinner, 2022; Warinner & Lewis, 2015). In the absence of oral cleaning, food matter and plant phytoliths can build up on the surface of teeth, typically within spaces between teeth and at the gumline, and be preserved long after death. For the purpose of this study, dental calculus was scored as absent or present, irrespective of the degree of formation on either the lingual or labial/buccal aspect of the tooth. Periodontal disease typically results from advanced gingivitis where the inflammation around a tooth, often accompanied by dental calculus, leads to loss of the alveolar bone and, eventually, tooth loss (Ortner, 2003). Progression of the disease appears as slight to severe resorption of the alveolar bone, creating distance between the bone and the CEJ of the tooth, and, in advanced cases, the tooth can eventually be lost, and remodeling can occur. In older individuals, there can be substantive antemortem tooth loss, progressing posteriorly to anteriorly consistently with calculus formation, in light of advanced periodontal disease. Periodontal disease was scored as "present" if the alveolar bone displayed porosity from the trabecular bone exposure and if the distance between the CEJ and the alveolar crest (AC) is greater than 2 mm. Dental wear and antemortem tooth loss were recorded as general indicators of oral health and, potentially, relative age as either absent or present.

Periosteal new bone formation of the long bones, particularly the tibia, is characterized by macroscopic changes to the surface of bones by producing nonspecific bony lesions as part of a general inflammatory response to infection or trauma to the periosteum. Proliferative lesions and healing activity were recorded for the long bones of the lower limb, particularly the tibia. Evidence of degenerative joint disease, such as osteoarthritic lesions, pitting, porosity, lipping, and eburnation at joint surfaces, as well as any associated trauma, were recorded (Buikstra & Ubelaker, 1994). Potential evidence consistent with antemortem or perimortem binding, such as altered bone architecture and evidence of acute worn areas of trabecular bone, specifically that of the wrists and ankles, was recorded.

Cultural modifications that occurred antemortem (*e.g.,* cranial modifications, dental inlays, and filing) were recorded so that they could be differentiated from postmortem taphonomic alterations. Archival information and site reports provided additional information about cultural modifications for those three individuals who could not be directly analyzed for this research (Willey *et al*., 1965). Cranial modifications are mainly observed *in situ* since the removal of the skull from the soil matrix often causes fractures in the cranial vault. In such cases, we relied on field reports. Dental modifications were noted based on available anterior teeth (those that are most often subject to filing or inlays) during excavation and post-excavation analysis. A designation of "no data" indicates that the skeletal elements necessary for scoring were not available for assessment. A designation of "none observed" is based on the remains available that lacked evidence of cranial or dental modification, but it is noted in this designation that it cannot rule out that cranial and dental modifications may have been present if the cranium is fragmented, or the teeth are too worn for observations. We make this nuanced distinction to reflect the data that are available, rather than to speculate on what is not.

Taphonomic and Archaeothanatological Analyses of Binding or Wrapping

Reconstructing the mortuary patterns and identities of the VPLF burials requires an understanding of the internal and external forces that contributed to the appearance of the excavated grave. There are two processes to consider: (1) the intentional and unintentional acts that led to the formation of the burial context by the once-living population and (2) the taphonomic factors that modified the burial deposit either from humans (*e.g.,* looting, excavation damage, curation damage) or nonhuman induced sources (*e.g.,* bioturbation, plant damage, animal scavenging, weathering) (Duday & Guillon, 2006; Harris & Tayles, 2012). In archaeothanatology, the most important taphonomic processes are related to the force of gravity on the decomposition of the corpse and the resulting movements of the remains within the burial environment relative to other forces, which may include the space in the grave, soil settling, root invasion, water movement, and constriction from the burial container. During decomposition, soft tissues of the body will disappear and the tendons and ligaments that bind elements together will break down, leading to the destabilization of bones and their movement to a more stable position. After a time, sediment will — either simultaneously or slowly — move into the void spaces where soft tissues have decomposed, and the bones will become stabilized in place. How these processes occur depends entirely on the internal and external environments surrounding the corpse. For burials that may have been bound or wrapped, there are certain expectations about how the bones are positioned within the burial context with respect to the cut of the grave, accompanying burial items, and the nature of the burial container (see chapters 4 and 5 of Duday, 2009 and examples from Harris & Tayles, 2012 and Nilsson Stutz, 2006). In the absence of direct evidence (*e.g.,* preserved wrapping materials), we must rely on indirect evidence through the position of the bones in the burial environment to inform our interpretations. For VPLF burials, the evidence put forth for the binding hypothesis is the sustained flexing of the lower leg, the precarious positioning of the feet over the pelvis, and, in some cases, the positioning of the arms tight to the hips after decomposition as evidence of wrapping or binding. While this could be the case, there is also a possibility that other factors may have led to the positioning of the remains in this way after decomposition.

One major challenge we experienced with conducting an archaeothanatological analysis of the VPLF burials to determine whether they were bound at death is that the existing criteria are based on individuals who were laid supine in the grave (see criteria described in Table 2 by Harris & Tayles, 2012 and in Box 1 by Nilsson Stutz, 2006). Therefore, we cannot use criteria like the positioning of the patellae to interpret binding, because the prone, flexed position of the legs prevents the patellae from falling laterally, and femoral rotation differs in this position. Given this scenario, we must adjust our assumptions about the force of gravity and sedimentary fill within the grave and how it would have impacted the movement of skeletal elements for VPLFs and the potential sources of taphonomic impact (Tables 3 and 4). The main criteria are in reference to the claim that the lower limbs were bound after death, and the methods we adopted from Harris and Tayles (2012) allow for the identification of five types of burial contexts. Three of these have been labeled binding or wrapping to be consistent with our hypothesis.

All burial contexts are described, and the criteria with predicted skeletal response are summarized in Table 4. The combination of the lack of external space and no constriction, either of the entire skeleton or a portion of it, would suggest burials were laid in either loose non-durable binding or wrapping or none at all since we could not differentiate the two in the absence of direct binding evidence. In some cases, it was suggested that the upper limbs were bound as well, while in others binding was only evident at the lower limbs either because of apparent variation

Table 3 Macroscopic taphonomic observations for VPLF burials (modified from Pokines & Jans, 2022)

General condition of remains (excellent, good, fair, poor)
Mineral staining
Algal staining
General soil staining
Retained grease texture
Adhering dried soft tissue
Surface cracking from drying of waterlogged bone
Weathering (based on criteria developed by Behrensmeyer, 1978)
Thermal alteration
Plant root damage—adhering and/or infiltrating the bone
Adhering or infiltrating soils and sediments
Postmortem breakage
Excavation damage (tool marks)
Cortical exfoliation of bone (loss in thin layers)
Marine alteration (rounding, bleaching, adhering marine taxa)
Writing, labeling, other non-biological substances (adhesive, tape, wax, resin, packaging)
Curation damage and alteration
Carnivore damage
Rodent damage
Termite damage
Other

in upper limb placement or the absence of preserved upper limb bones. Burials classified as tight nondurable binding were made of flexible, biodegradable materials that decompose quickly but caused constriction of the limbs in their respective position with some variation with the binding materials decomposing before the joint ligaments. Here, observations about the grave cut are important for distinguishing between tight nondurable and loose durable wrappings. Tight durable bindings are identified by constriction and the preservation of unstable joints that would otherwise seek equilibrium in the absence of a "wall effect" or *effet de parois*. Certain wall effects are distinguishable between tight durable binding and those found in narrow containers mainly based on the preserved grave architecture and features. A wide container is evident based on the external space and no constriction but with the presence of grave architecture and burial features. Since the ancient Maya did not bury their dead in wooden coffins, these criteria have been modified to include observations of grave architecture. These expectations, like those outlined by our colleagues, are a general guide for what we anticipate if the VPLF burials were bound upon burial; however, we cannot rule out alternative explanations for the positioning of the remains, including the cut of the grave and narrowness of the structure or the slope of the feature, all of which could influence the skeleton.

For our taphonomic analysis during excavation, we relied on recorded observations made during initial excavation by Willey and colleagues (1965) and BVAR field reports (Biggie *et al.*, 2019; Green Mink & Bye, 2020; Watkins *et al.*, 2017),

Table 4 Burial context descriptions and criteria for their identification (modified from Harris & Tayles, 2012)

Burial context	Description	Criteria and skeletal response
Loose nondurable binding/no binding	Body buried without a container or loosely bound or wrapped in a material that decomposed quickly	Internal or no space. No constriction evidenced on the upper or lower limbs, or constriction present with no evidence that the grave cut was wider than the constriction (*e.g.,* narrow grave cut)
Tight nondurable binding	Body tightly bound or wrapped in a material that decomposed quickly (*e.g.,* burial wrappings)	Internal space only, constriction of upper or lower limbs. Grave cut was wider than the constriction. May see slight indications of verticalization of the pectoral girdle and/or partial constriction of the tibiae and fibulae to the femur, although there is disarticulation in the pelvis and femoral head
Tight durable binding	Body tightly bound or wrapped in a material that decomposed slowly (*e.g.,* fibrous rope)	Limited external space. Identified constriction of the upper and/or lower limbs with a combined wall effect that conforms to the shape of the body. Hand and feet bones remain articulated in a space where they would normally fall into equilibrium or void spaces. Verticalization of the clavicles and upwards rotation of the scapulae and humeri, if upper limbs are bound. Constriction of the lower limbs with the tibiae and fibulae stable atop the femur that remains articulated to the pelvis
Narrow burial container	Body placed in a narrow stone container or surrounding grave architecture	Limited external space present as body was constricted by tight contact with grave architecture or grave goods such that no external space was present. Uses the same criteria as tight durable wrapping with evidence of grave architecture
Wide burial container	Body placed in a wide stone container or surrounding grave architecture	Internal and external space, no constriction. Similar to loose or no binding with evidence of wide architecture or no wall effect from grave goods

including drawings, photographs, field notes, and plan maps. While not ideal, this approach was successful when conducted by Harris and Tayles (2012) for their assessment of burial containers at Ban Non Wat and Nilsson Stutz's (2006) post-excavation analysis of bound burials at Zvejnieki. In general, during excavation, observations about the position of the remains within the mortuary context, affiliated burial accompaniments, and grave architecture and broader structural context should be documented to fully account for the natural and anthropogenic taphonomic forces affecting the completeness, preservation, and movement of the remains. Where possible, data on the relative position of each skeletal element to another was noted, as well as their position to associated burial accompaniments and structures. Where possible, we also noted observations about the grave cut and slope of the grave, as well as field observations about taphonomic forces from water flow, root invasion, and so on. These data were also supplemented by an in-depth taphonomic analysis of the curated remains to infer the role of external taphonomic forces on the preservation and possible mobility of the remains in the grave (Freiwald, 2019; Knüsel & Robb, 2016; Schultz, 2012). Importantly, these data also provide contextual information on the burial position and limb orientation of the VPLFs *in situ*, which is essential for addressing questions about the nature of their deposition and decomposition that cannot be addressed in a laboratory setting.

For the majority of the VPLF burials, laboratory analysis of the macroscopic taphonomic data is collected through thorough observations of the remains within these collections by the first author. Aside from the aforementioned VPLF burials at the Lower Dover palace (CT2 Burial 1) and Tutu Uitz Na (SG1 Burial 2 Individual 1, SG1 Burial 3), the remaining burials from Barton Ramie that were available for analysis have been under curation since the 1950s. Given the antiquity and continued study of the collections for this research, we approached the analysis through a combined laboratory observation and archival reconstruction framework, where archival documentation provided distinguishing information on taphonomic alteration resulting from previous destructive sampling for stable isotope analyses (Freiwald, 2011; Gerry, 1993; Krueger, 1985). The macroscopic taphonomic observations that were recorded in this study were modified from Pokines and Jans (2021: 719–721), which are based on a two-page checklist developed by Pokines (Table 3). Taphonomic observations were recorded for (1) overall condition of the remains (preservation and completeness) and (2) a detailed inventory of observed taphonomic alterations through natural (*e.g.,* weathering, plant, animal, bird, insect damage, fractures from drying and wet bone soil staining and adhesion, postmortem breakage) and anthropogenic forces (*e.g.,* excavation damage and curation/cultural modifications, adhesive, cut marks, analysis cuts).

Results

Summary Osteological and Chemical Analyses of VPLF Burials

We describe each of the 12 VPLF burials in detail in our Supplemental Materials and provide collated results below (Table 5). The results of biogeochemical analyses

Table 5 Summary description of skeletal analyses of VPLF burials

BVAR burial #	MNI	Preservation and completeness	Burial type	Position and orientation	Sex estimation	Age-at-death	Paleopathological observations	Skeletal modifications
BR-82 Burial 1[a]	1	Unknown	Primary	VPLF Prone Head to south Face down with hands crossed at the pelvis	No data	Adult	No data	No data
BR-123 Burial 7	1	Fragmentary (< 25% present)	Primary	VPLF Prone Head to the south	Indeterminate	> 16 years	Tibial periostitis (healed)	None observed based on available dentition and completeness of the cranium in the grave
BR-123 Burial 9	1	Partial (25–75% present)	Primary	VPLF Prone Head to the south	Probable female	65 + years	Porotic hyperostosis (healed) Cribra orbitalia (healed) Moderate dental attrition Antemortem tooth loss Periodontal disease Caries (CEJ) LEH	None observed based on available dentition and completeness of the cranium in the grave
BR-123 Burial 17	1	Fragmentary (< 25% present)	No data	VPLF Prone Head to the south	Possible male	17–26 years	Tibial periostitis (mixed) Porotic hyperostosis (mixed)	Dental modification filing (A1; Romero, 1951, 1970)

Table 5 (continued)

BVAR burial #	MNI	Preservation and completeness	Burial type	Position and orientation	Sex estimation	Age-at-death	Paleopathological observations	Skeletal modifications
BR-123 Burial 20	1	Fragmentary (< 25% present)	Primary	VPLF Prone Head to the south Face downward	Possible male	20–30 years	Dental calculus Minimum dental attrition Caries (CEJ) LEH	None observed based on available dentition and completeness of the cranium in the grave
BR-123 Burial 23	1	Fragmentary (< 25% present)	Primary	VPLF Prone Head to the south Face downward/facing west	Indeterminate	15 (12–18) years	Dental calculus	None observed based on available dentition and completeness of the cranium in the grave
BR-135 Burial 1	1	Fragmentary (< 25% present)	Primary	VPLF Prone Head to the south Face down	NA	8 (6–10) years	LEH	None observed based on available dentition and completeness of the cranium in the grave
BR-167 Burial 2[a]	1	Partial (25–75% present)	Primary	VPLF Prone Head to the south Face down with hands at sides and crossing over burial 3 thorax	Possible male	Older adult	Considerable dental attrition	No data
BR-167 Burial 4[a]	1	Unknown	Primary	VPLF Prone Head to south Hands at the side	Possible female	Older adult	Considerable dental attrition	No data

Table 5 (continued)

BVAR burial #	MNI	Preservation and completeness	Burial type	Position and orientation	Sex estimation	Age-at-death	Paleopathological observations	Skeletal modifications
CT 2 Burial 1	1	Partial (25–75% present)	Primary	VPLF Prone Head to the south Hands at sides	Possible male	46.4 (13–77.1) years	LEH Dental calculus Caries Periodontal disease Moderate dental attrition Antemortem tooth loss	Dental modification, filing (central incisors—B4; Romero, 1951, 1970)
SG 1 Burial 2, Individual 1	1	Partial (25–75% present)	Primary	VPLF Prone Head to the south Hands beneath the pelvis	Possible female	22.1 (17–28) years	None observed — missing cranial and upper axial skeleton from looters' trench	None observed based on available dentition and completeness of the cranium in the grave
SG 1 Burial 3, Individual 1	1	Partial (25–75% present)	Primary	VPLF Prone Head to the north Hands at sides	Indeterminant	30 (16.7–42.3) years	LEH Caries Periodontal disease Moderate dental attrition	Dental modification, filing (central maxillary incisors – B5, lateral maxillary incisors – C3, maxillary canines – F4, maxillary and mandibular first premolars – D4(?), mandibular central and lateral incisors – A1; Romero, 1951, 1970) Cranial modification

[a] Individuals were not available for reanalysis by authors

Table 6 Radiocarbon dates for VPLF burials, calibrated using the OxCal program v.4.4 (from Walden, 2021)

Burial #	Material	Lab number	Conventional ^{14}C yr (BP)	2σ calibrated range
SG 1 Burial 2, Individual 1	Bone collagen	PSU-3367	1210 ± 15	780–880 CE
SG 1 Burial 3	Bone collagen	PSU-3365	1190 ± 20	770–890 CE

are presented in Tables 6 and 7. Taphonomic observations and their implications for VPLF positioning are reported separately in Table 8, and these are discussed in detail in the "Biocultural Taphonomic Observations and Archaeothanatological Assessment of Evidence of Binding" section. Eleven of the 12 VPLF burials date to between 600 and 900 CE based on ceramics and architectural stratigraphy, which was supported by radiocarbon dating of two individuals who both date to between *cal*. 770–890 CE (Table 6). Age-at-death was estimated for nine of the VPLF burials resulting in a wide distribution of estimated ages ranging from nonadults, with the youngest being approximately 8.5 years of age, to senescent adults likely over the age of 65 (Table 5). Sex was estimated for ten of the adults: four male/possible male (40%), three female/possible female (30%), and three of indeterminate sex (30%) (Table 5).

As noted above, BR-82 Burial 1, BR-167 Burial 2, and BR-167 Burial 4 were not available for paleopathological analysis as these remains were never exported to the PMAE. Paleopathological observations were directly made on the other nine individuals. Inherent paleopathological limitations of this study include the level of preservation and completeness of the burials. Of the available burials for study, seven individuals (78%) had visible skeletal lesions consistent with nonspecific markers of underlying frailty (*e.g.,* tibial periostitis, porotic hyperostosis, cribra orbitalia, and linear enamel hypoplasia). Dental pathologies consistent with diet and oral health were the most prevalent across the VPLF burials, irrespective of estimated age, sex, and social status. In particular, dental calculus formation is consistent with an agricultural diet mainly consisting of maize, which would have been the case for all individuals (Ebert *et al*., 2019, 2021; Walden, 2021). Several individuals had co-occurring dental pathologies, including calculus, carious lesions, dental attrition, and, among the older individuals, antemortem tooth loss. A total of three (25%) of the individuals have dental and/or cranial modification. A site-wide comparison of skeletal pathologies and mortality risk of individuals interred in VPLF and non-VPLF burials, as well as by age, sex, and social status, is forthcoming.

Biocultural Taphonomic Observations and Archaeothanatological Assessment of Evidence of Binding

Table 8 summarizes the macroscopic observations of those VPLF burials that could be analyzed after excavation within a laboratory environment. Table 9 summarizes our findings from our archaeothanatological analysis of documentary evidence of the

Table 7 Stable isotope values for VPLF burials expressed as ‰. One entry for % yield listed in Gerry (1993) for *N* and *C* values

Burial #	Element	$\delta^{13}C_{co}$	%C	$\delta^{15}N_{co}$	%N	C:N	$\delta^{13}C_{ap}$	$^{87}Sr/^{86}Sr_{en}$	Reference
BR-123 Burial 9 (N8857.33)	Femur or other long bone	−13.3	4.3	8.8	4.3	3.35	−7.9		Gerry, 1993:208, 251, Appendix A
	LLM1							0.709584	Freiwald, 2021:123, Table 1.3
BR-123 Burial 23 (N8857.42)	Femur or other long bone	−10.6	7.69	9.2	7.69	3.37	−6.5		Gerry, 1993:208, 251, Appendix A
	LRM1							0.708560	Freiwald, 2021:36, Table 1.3
SG 1 Burial 2, Individual 1	Femur	−9.2	11.1	8.7	4.0	3.2			Walden, 2021:358
SG 1 Burial 3	Femur	−11.2	12.1	7.7	4.4	3.2			Walden, 2021:360

Table 8 Macroscopic taphonomic observations of VPLFs

BVAR burial #	General condition	Macroscopic taphonomic observations
BR-82 Burial 1[a]	Poor	Likely postmortem damage from excavation and cleaning, corrosion, soil adhering and infiltration of bones, surface cracking
BR-123 Burial 7	Poor	Soil staining, surface cracking from drying bone, corrosion, adhering/infiltrating clay sediment, post-mortem damage from excavation and cleaning, writing, curation damage
BR-123 Burial 9	Poor	Soil staining, surface cracking from drying bone, corrosion, adhering/infiltrating clay sediment, post-mortem damage from excavation and cleaning, writing, curation damage
BR-123 Burial 17	Poor	Soil staining, surface cracking from drying bone, corrosion, adhering/infiltrating clay sediment, post-mortem damage from excavation and cleaning, writing, curation damage
BR-123 Burial 20	Poor	Soil staining, surface cracking from drying bone, corrosion, adhering/infiltrating clay sediment, post-mortem damage from excavation and cleaning, adhesive, curation damage
BR-123 Burial 23	Poor	Soil staining, surface cracking from drying bone, corrosion, adhering/infiltrating clay sediment, post-mortem breakage, excavation damage, writing, adhesive, curation damage
BR-135 Burial 1	Poor	Soil staining, surface cracking from drying bone, corrosion, adhering/infiltrating clay sediment, postmortem damage from excavation and cleaning, writing, adhesive, curation damage, scientific sampling for aDNA
BR-167 Burial 2[a]	Poor	Likely postmortem breakage, corrosion, soil adhering and infiltration of bones, surface cracking
BR-167 Burial 4[a]	Poor	Likely postmortem breakage, corrosion, soil adhering and infiltration of bones, surface cracking
CT2 Burial 1	Poor	Highly fragmentary, postmortem damage from excavation and cleaning, corrosion, soil adhesion and infiltration of bones
SG 1 Burial 2, Individual 1	Poor	Disturbed by looters trench postmortem. Postmortem damage from excavation and cleaning, soil staining, corrosion, soil adhesion and infiltration of the bones, root invasion
SG 1 Burial 3	Poor	Postmortem damage from excavation and cleaning, soil staining, soil adhesion and infiltration of the bones, root invasion

[a]Individuals were not available for reanalysis by authors and observations reported are from the original excavation reports

Table 9 Description of stable and unstable joint responses, grave features, and assigned burial context for Lower Dover VPLF burials

BR-82 Burial 1	**Burial context:** Tight, nondurable binding of the lower limbs, possible nondurable binding of hands at the hip **Labile joints:** Tarsals, metatarsals, and phalanges preserved in articulation on the posterior portion of the pelvis; hand bones are articulated and placed anteriorly to the pelvis. Cervical vertebrae appear anatomically articulated to the skull **Persistent joints:** Knees bent, slight rotation of the proximal femora with tibiae constricted towards the midline. Humeral heads articulated to glenoid fossae of the scapulae **Effet de parois:** Tibiae and fibulae are flexed at the knees so that they are found adjacent to the corresponding femur with the feet tightly constrained to the pelvis. Both feet are constricted to the posterior pelvis such that the distal phalanges are oriented towards the skull and metatarsals are anatomically positioned and articulated **Evidence of grave cut, architecture, or grave accompaniments:** Grave cut larger than the constriction. Two vessels found in the grave cut, neither in direct contact with the remains
BR-123 Burial 7	**Burial context:** Loose or tight, nondurable binding of the lower limbs. Loose or no binding of upper limbs **Labile joints:** Left carpal, metacarpal, and phalanges appear anatomically articulated with the palmar surface oriented towards the lateral left femur and several other bones scattered in the pelvic region. No foot bones recovered **Persistent joints:** Knee appears bent as the right tibia and fibula were recovered in situ adjacent to the right femur, indicated flexed at death **Effet de parois:** Right tibia and fibula are constrained medially with the femur positioned laterally. No foot bones recovered **Evidence of grave cut, architecture, or grave accompaniments:** No data reported on grave cut size, except that it was disturbed by later interments of Burials 8 and 9. No grave architecture or grave goods
BR-123 Burial 9	**Burial context:** Loose or tight, nondurable binding of the lower limbs. Loose or no binding of upper limbs **Labile joints:** Left hand laid beneath lower pelvis, articulated right hand laid at right leg, articulated **Persistent joints:** Both knees bent so that the tibiae and fibulae were adjacent to the corresponding femurs. Right arm laid along the right side with palmar surface oriented posteriorly **Effet de parois:** Tibiae and fibulae are flexed at the knees so that they are found adjacent to the corresponding femur. No foot bones recovered **Evidence of grave cut, architecture, or grave accompaniments:** No data reported on grave cut size, except that it was likely deposited after Burial 7. No grave architecture or grave goods
BR-123 Burial 17	**Burial context:** Tight, nondurable binding of the lower limbs. Loose or no binding of upper limbs **Labile joints:** Remains highly disturbed, intrusive burial. Cranium smashed but the cervical vertebrae appear articulated **Persistent joints:** Left humerus, right radius, and ulna, and left femur and tibia in situ in general burial placement. The only joint is the knee joint, flexed **Effet de parois:** Right tibia is tightly flexed at the knee so that it is adjacent to the right femur. No foot bones recovered **Evidence of grave cut, architecture, or grave accompaniments:** Grave cut likely larger than the constriction based on the placement of vessel 1. Buried with one vessel a distance of .18 m from the cranium. No grave architecture

Table 9 (continued)

BR-123 Burial 20	**Burial context:** Loose or tight, nondurable binding of the lower limbs. No binding of upper limbs **Labile joints:** Right hand lay with the palmar surface under the left humerus with the bones articulated and stable **Persistent joints:** Right arm bent at the elbow, left elbow slightly bent so that hand may have been placed at the hip. Knees bent, proximal femurs missing **Effet de parois:** Tibiae and fibulae are flexed at the knees so that they are found adjacent to the corresponding femur. No foot bones recovered **Evidence of grave cut, architecture, or grave accompaniments:** No data reported on grave cut size. The skull was laid face down inside a small bowl with another found to the right side on top of the back of the skull. No grave architecture
BR-123 Burial 23	**Burial context:** Loose, nondurable binding of the lower limbs **Labile joints:** Head was facedown, slightly to the west. Right hand articulated lay palmar surface anterior to the ventral pelvis **Persistent joints:** Left arm along the side of the body, right arm bent towards the pelvis. Knees bent and laid slightly to the right and parallel **Effet de parois:** Tibiae and fibulae are flexed at the knees so that they are found adjacent to the corresponding femur, slightly leaning to the right **Evidence of grave cut, architecture, or grave accompaniments:** Intrusive burial through plaster floor, so likely narrow cut. No architectural features were present. No grave goods were present
BR-135 Burial 1	**Burial context:** Loose, nondurable binding of the lower limbs **Labile joints:** No data reported in the site report **Persistent joints:** Knees bent with lower legs constricted to the upper legs and pelvis. Right arm placed at the front of the pelvis **Effet de parois:** Tibiae and fibulae are flexed at the knees so that they are found adjacent to the corresponding femur **Evidence of grave cut, architecture, or grave accompaniments:** Intrusive burial through plaster floor, so likely narrow cut. No architectural features were present. Two large vessels were more closely associated with Burial 2, also an intrusive burial
BR-167 Burial 2	**Burial context:** Tight, nondurable binding of the lower limbs **Labile joints:** Tarsals, metatarsals, and phalanges preserved in articulation on the posterior portion of the pelvis **Persistent joints:** Knees bent with lower legs flexed back with feet over the pelvic region. Left arm flexed back and overlay the arm and rib case of Burial 3 **Effet de parois:** Tibiae and fibulae are flexed at the knees so that they are found adjacent to the corresponding femur. Knees appear constricted medially. Both feet are constricted to the posterior pelvis such that the distal phalanges are oriented towards the skull and metatarsals are anatomically positioned and articulated **Evidence of grave cut, architecture, or grave accompaniments:** Likely larger than the individual as it is possible that Burials 2, 3, and 4 were deposited in close succession. No architectural features were present. No grave goods were present

Table 9 (continued)

BR-167 Burial 4	**Burial context:** Tight, nondurable binding of the lower limbs **Labile joints:** Tarsals, metatarsals, and phalanges preserved in articulation on the posterior portion of the pelvis **Persistent joints:** Knees bent with lower legs flexed back with feet over the pelvic region **Effet de parois:** Tibiae and fibulae are flexed at the knees so that they are found adjacent to the corresponding femur. Knees appear constricted medially. Both feet are constricted to the posterior pelvis such that the distal phalanges are oriented towards the skull and metatarsals are anatomically positioned and articulated **Evidence of grave cut, architecture, or grave accompaniments:** Likely larger than the individual as it is possible that Burials 2, 3, and 4 were deposited in close succession. No architectural features were present. No grave goods were present
CT2 Burial 1	**Burial context:** Loose, nondurable binding of the lower limbs **Labile joints:** Limited hand fragments recovered. Cervical vertebrae recovered in relative burial position. Rib fragments and other thorax elements recovered in relative burial position, but highly fragmented **Persistent joints:** Knees bent with lower legs flexed back towards the pelvis. Left arm disturbed from root activity. Right arm laid relatively along the side of the thorax **Effet de parois:** Tibiae and fibulae are flexed at the knees so that they are found adjacent to the corresponding femur. The legs appear slightly slumped to the left. No foot bones were recovered during excavation **Evidence of grave cut, architecture, or grave accompaniments:** Likely larger than the individual based on the associated peri-abandonment deposit. Associated with peri-abandonment deposit. Wall effect from being placed against the western exterior wall of the eastern structure

VPLF burials, namely the presence of stable and unstable joints, grave features, and the assigned burial context based on those outlined in Table 4. Reported taphonomic observations for BR-82 Burial 1 and BR-167 Burials 2 and 4 were based on information from Elliot and Bleibtreu (reported in Willey *et al.*, 1965). The emphasis on a thorough laboratory analysis allows us to discern the range of taphonomic variables that may have contributed to the appearance and movement of the remains prior to excavation that are not otherwise recorded in the original burial notes. While archaeothanatological literature places a heavy emphasis on the role of gravity and decomposition in the post-depositional movement of human remains within various burial contexts, forensic taphonomy studies have also demonstrated that the presence of other variables, such as root invasion, animal activity, fluvial environments, and the nature of substrate, is also contributing forces on mobility during and after decomposition (Pokines & Baker, 2022). Prior to engaging with any of these potential factors, it was important to first understand the nature of the VPLF burial contexts at Lower Dover.

Original photographs and plan maps of the VPLF burials strongly suggest that they were primary burials that were deposited in simple graves wherein they decomposed in mostly filled spaces where the soil would eventually fill in voids left from the decomposition of soft tissues. All burials were interred in architectural fill predominantly composed of clay soils with limestone and river cobbles, or, in the case of the individual interred in the Lower Dover palace, a cultural peri-abandonment deposit (Watkins *et al.*, 2017). Peri-abandonment deposits represent dense sheet middens of artifacts placed in the plazas of major centers in the Belize River Valley around the time of abandonment in the Terminal Classic (Awe *et al.*, 2020; Hoggarth *et al.*, 2020a). Based on the physical position of the skeletons respective to architectural structures and burial items, it is likely that the other 11 individuals were buried directly in the construction fill of the house platform without a mortuary container. Willey and colleagues (1965: 114) noted that there were several burials in the BR-123 house platform that were interred in House Floor F, including two VPLF burials BR-123 Burials 7 and 9 that were near each other and Burial 8 (not a VPLF), as well as an earlier burial (Burial 16) that was intrusive into the above floor. This example demonstrates two things. First, VPLF and nonVPLF burial patterns coexisted within the same house floors. Second, the proximity of Burials 7, 9, 8, and 16 and their apparent retainment of their burial position supports that they were independently deposited over a period of time as primary burials, but that those events may have resulted in the disturbance of earlier burials (see Supplemental discussion about BR-123 Burials 7 and 9, also BR-167 Burials 2 and 4). This kind of human-induced taphonomic action likely resulted in some of the shifting of skeletal elements after decomposition. However, even with the partial disturbance of some of the elements by later intrusions, the preserved anatomical connections across all VPLF burials support that these were primary deposits laid in fill (Table 9).

During putrefaction and decomposition, some joints will disappear before others based on the rapid decomposition of articulating tendons and ligaments, which means that if those "unstable" joints are intact during excavation, the burial is likely a primary one, and if the joints are particularly prone to readjustment during decomposition, there may have been some stabilizing factor (*e.g.,* wrapping, a wall, soil, or other feature) leading to the appearance of the remains. As seen in Table 9, even in partial burials, the preservation of particularly labile joints during excavation and subsequent mapping and photographs demonstrates that those joints were articulated within the short window of time between death and deposition (Duday, 2009: 28–29). In particular, the articulation of the interphalangeal and intermetatarsal joints of the feet and, in some instances, the interphalangeal and intercarpal and metacarpal joints of the hands were noted among several of the VPLF burials. These joints tend to break down quickly during decomposition, resulting in the scattering and loss of the smaller bones, and this rate is expected to be faster in humid, wet burial environments like that of Belize (Duday, 2009: 27). These observations are also noted in the points of articulation in the pectoral girdle, rib cage, and hip joint; however, while there were observed connections in the upper arm and wrist, there was noted variation in the placement of the arms relative to the body throughout. The more persistent joint of the knee, while bent in VPLFs, is largely maintained with the tibia remaining stable atop the femur throughout decomposition and present during excavation. The presence of funerary materials, such as ceramic vessels, and architectural features may have contributed to the stability of some of the elements. However, the majority of the VPLFs were interred with sparse materials, often at a distance from the remains, or with partial reliance on structures (Fig. 1). For example, BR-123 Burial 20 was buried with the head resting in a bowl with a second vessel placed over the head, which was laid face down inside the bowl (Willey *et al.*, 1965: 101, 120).

Primary burials can change naturally over time with the introduction of other taphonomic forces that can move anatomical connections out of place and into other states of stability. However, many of these observations are lost during excavation if not carefully noted, which is why the full range of taphonomic alterations were noted during laboratory analysis. Nine individuals (75%) have observed soil staining and adhesion or infiltration and corrosion leading to the deterioration of the bone, particularly when lifted out of situ since these bones were also cracked from past waterlogging and drying. Previous reports describe the soils to be acidic, predominantly clay with limestone, which can have detrimental effects on bone preservation (Casallas & Moore, 2012; Crow, 2008; Pokines & Baker, 2022; Pokines *et al.*, 2022). Soils that are acidic and have added characteristics of limestone and groundwater, which is the case for most burials at Lower Dover, tend to produce acidic soil corrosion on the exposed surfaces of the buried remains. White and Hannus (1983) demonstrated that hydroxyapatite crystals ($Ca_5(PO_4)_3(OH)$) in an acidic soil solution are depleted of calcium ions by their replacement with hydrogen ions as equilibrium is reached, which essentially means that skeletal remains in an acidic soil environment with high water content are under the risk of increased dissolution of the mineral content of the bones, thus leading to bone corrosion and fragility. They also showed that the breakdown of collagen in the bone contributed to the deterioration of the bones. This taphonomic effect is most evident in parts of the skeleton where the cortical bone is the thinnest and in less dense bones, particularly those of the thoracic skeleton, which have largely been reported as missing or highly fragmented in this study.

Another study of Maya burials at Chau Hiix, including some VPLF burials, identified that soil composition, grave depth, disturbance, age at death, and cortical bone thickness were important variables in observed differences in the rate of fluoride absorption by altering the access of water to bone (Wrobel, 2007). Specifically, those burials interred in house floors were more greatly protected from water drainage, which as we previously pointed out leads to greater dissolution of mineral content in bones, due to the packed construction of fill and plaster floors (Wrobel, 2007). Conversely, intrusive burials were more likely to be penetrated by rain and groundwater, thus increasing their levels of fluoride compared to nearby nonintrusive burials. This phenomenon helps explain the apparent differences in the preservation of VPLF burials even within the same burial structures. The fact that the VPLF burials were interred in largely clay soil also may explain some of the minor disturbances observed in the bones as the burials were undergoing the process of filling during decomposition. According to Duday (2009: 54), three mechanisms contribute to the process of filling the grave with sediment during decomposition: the force of gravity as the sediment above falls into the spaces left within the corpse during decomposition, the increase in the volume of clay sediment as it gets wet from adjacent decomposing soft tissue, and disturbances by small animals. Since the VPLF burials were not placed in coffins or some other burial container, the bodies were likely placed in graves with fill that would exert some pressure on the remains and, as space becomes freed by the removal of soft tissue, sediment would eventually fill those spaces and cause some movement until the remains find equilibrium. Clay soil also adds to minor movement since it will expand when in contact with moisture, whether that be because of decomposing soft tissue, rainwater, or groundwater. Lastly, bioturbation from animal activity can add to the movement of bones, although no evidence of burrowing or scavenging was noted in the excavation reports or on the bones. It is possible that worm activity was a factor, although none of our observations can substantiate this confidently. Ultimately, environments with high soil acidity, high annual temperature, and high humidity tend to result in high dissolution of interred remains, which leads to increased chances of postmortem destruction from excavation and removal (Pokines & Baker, 2022).

Plant activity, particularly from the roots of trees and other flora, can result in the movements of human remains, and since Lower Dover was likely overgrown by the tropical forest after the depopulation of the polity, it is likely that this significant overgrowth affected the appearance of the burials. Root invasion was also noted on two of the burials from Tutu Uitz Na, with bones displaying signs of damage and etching. Human remains provide highly concentrated nutrients to plants and they also have the capacity to trap water, which makes them especially prone to root invasion and damage (Pokines & Baker, 2022). Of note, buried remains often will have tiny root structures growing through the diaphyses of long bones or through foramina. Root invasion can lead to the potential destruction of the bone as plant roots do secrete chemical compounds that can produce etching on the surface of the bone, which can be mistaken for cut marks, pathological conditions, abrasions, and vascular grooves (Pokines & Baker, 2022). Through a combination of highly acidic, dense, and tropical clay soils and the challenges with removal and cleaning, all burials were in poor condition upon analysis despite having been recorded as being mostly complete during excavation. Archival work suggests that the most extreme post-excavation cultural taphonomic alterations on the Barton Ramie burials occurred during post-excavation exportation of the remains, although other minor taphonomic changes resulted from curation, cataloging, cranial fragment reconstruction, and later scientific analysis of the remains. These included evidence of writing on the skeletal elements to record their burial number, dental reconstruction, cranial fragments, and long bone fragments for reconstruction, which likely occurred shortly after their arrival in 1956. The only recent anthropogenic taphonomic changes observed on the remains was select analytical sampling.

The burial plan maps and excavation analyses demonstrated that these individuals were primary burials that were articulated at the time of death based on the preservation of stable and unstable joints, including the pelvic basin, knee, feet, and in some cases, hand joints (Duday, 2006; Duday & Guillon, 2006). It is possible, however, that the preservation of some of these more labile joints is the result of binding or wrapping around the time of deposition. Since there is no direct evidence of binding in the grave, we relied on the preservation of certain joints that decompose quickly after death and would otherwise restabilize if they had not been in a state of equilibrium because of some other supporting effect. Here, we relied on photographs of the platformed burials and, in some cases, plan maps from Willey and colleagues (1965) to distinguish whether feet and hands, specifically, were in place during decomposition. As previously discussed, the grave fill was composed of clay and limestone or cobbles, which could be sufficiently heavy enough to hold the legs down after burial. Furthermore, it is possible that the grave cuts for VPLFs were sufficiently narrow that it could have created an *effet de parois* from the constriction caused by the grave cut. However, the consistently tight positioning of the lower legs atop the upper leg with the feet constricted to the posterior portion of the pelvis — the feet often angled medially — indicates that these were likely bound prior to deposition to keep them in place (Table 9). Analysis of the burial maps, descriptions, and photographs from the original excavation demonstrates that VPLF burials consistently have persistent joints of the knees articulated in flexed position and, often, labile joints of the feet over the posterior pelvis articulated after skeletonization indicating binding (Table 9).

In some instances, it appeared that the legs may have slumped, and bodies shifted during decomposition which can happen if the binding is not durable or tight in a wider grave cut. No useful data were able to be discerned about the verticalization of the clavicles and bilateral pressure on the ribs based on the preservation of those elements. Still, it is likely that the limbs were placed relative to the body intentionally, either through binding or wrapping, since the phases of decomposition do not tend to result in the arrangement of the limbs in this way. Importantly, none of the individuals analyzed above showed signs of skeletal trauma consistent with binding on their lower leg bones, although the Barton Ramie burials had missing feet. The missing feet were likely due to excavation protocol, given that the individuals had feet in the photographs and plan maps. Previous analyses of two of the VPLF burials (SG 1 Burials 2 and 3) at Tutu Uitz Na by Green Mink and Bye (2020) indicate that there is no direct evidence of binding in their osteological analysis that would have resulted in perimortem trauma at the lower legs and feet. Additionally, the individuals were likely bound with biodegradable materials, which would not be preserved in the archaeological record. The high range of variation in the positioning of the upper limbs relative to the thorax, specifically regarding the positioning of the hands, suggests greater variation in the placement of the hands at death, either within a loose burial shroud at the sides, binding at the front of the waist, or some variation thereof.

Discussion

Archaeothanatology of the Lower Dover VPLF Burial Tradition

The central goal of this study was to analyze the VPLF funerary patterns at the Late and Terminal Classic Lower Dover polity through an interdisciplinary framework that directly engages with the taphonomic forces that impacted the burials before and after excavation. The sample of the Lower Dover VPLF burials is no doubt heavily impacted by sampling biases, and the implications of this fact are discussed further below. Nevertheless, our results show that individuals were interred in the VPLF position across the Lower Dover polity irrespective of demographic characteristics, geographic locale, and district membership. Further, it is clear that despite extensive postmortem damage resulting from bioturbation, highly acidic clay soils, and other taphonomic disturbances, the placement of the bodies in the VPLF position is purposeful and intentional and is not the direct result of taphonomic forces or changes from decomposition (Tables 8 and 9). All individuals were primary burials that were ventrally placed with their legs bent back so that their feet were in contact with the pelvis, and, among our sample, all individuals were placed face down with their heads oriented towards the south. Our application of archaeothanatology, albeit in a limited sense, has illustrated that it is possible to apply this method to post-excavated samples and contribute to a greater understanding of this mortuary tradition.

What makes the VPLF position special is that it became more common in northern Belize and the Cayes over the Late/Terminal Classic and Postclassic periods. Our results demonstrate, however, that this burial tradition may have its roots in earlier periods in the Upper Belize River Valley (see "Discussion" below). This emergence, along with its similarity to iconographic depictions of captives and sacrifices, has resulted in important discussions about the nature of the VPLF burials and their potential meaning. The results of our archaeothanatological analysis may support that individuals' legs were bound or, in any case, loosely wrapped upon deposition to maintain the placement of the lower legs and feet over the pelvis in articulation during rapid stages of decomposition. Alternatively, it is possible that the clay fill or the narrow cut of an intrusive grave may have created a stabilizing effect along with or in the absence of temporary binding. We do not believe this would have been enough to fully keep the bones of the feet in place in the precarious position over the pelvis, where spaces would eventually form through decomposition, or the positioning of the tibia and fibula over the femur as these two may rotate during decomposition. The range of variation of the rotation of the proximal femur instead may indicate that these individuals may have simply had their feet bound together behind the pelvis, rather than the lower legs tied to the upper legs. Our results also show that there was notable variation in the placement of the arms with most individuals having both aligned with the body with the hands towards the hips, although some had their elbows slightly bent and hands placed at the back or front of the pelvis. In some cases, it is possible that the hands were loosely bound in front of the hips when deposited in the grave, although the fact that there is obvious unilateral movement of the limbs in several VPLFs where one hand is at the pelvis while the other is not provided less support for this idea. This observed variation was also noted in later Postclassic VPLF burials at Lamanai, and these minor differences among the Lower Dover VPLFs could be an artifact of later intrusion, which displaced the hands ever so slightly. It would appear, then, that this positioning of the body was not only deliberate but also widespread along with other prevalent deathways.

Dating the Lower Dover VPLF Tradition

There is currently no evidence to suggest any of the VPLF burials from Lower Dover date to the Postclassic. The individuals who did possess grave accompaniments were interred with local Late and Terminal Classic period ceramics, and there is no evidence of local New Town Postclassic types or the Buk style Postclassic ceramics evident in northern Belize (Wrobel & Graham, 2015). Only one burial (BR-123 Burial 20) predates the Late or Terminal Classic periods. This individual was interred in the VPLF position, but with the head placed in a Floral Park phase Aguacate Orange: Privaccion Variety bowl. While Aguacate Orange ceramics became common in the Terminal Preclassic/Protoclassic (Floral Park phase) ~ 150 CE, they persisted through to the end of the Early Classic (Hermitage phase) around 600 CE (Lincoln, 1985). BR-123 Burial 20 requires radiocarbon dating to clarify whether this individual dates to the Terminal Preclassic or Early Classic periods or is a Late/Terminal Classic individual buried with an heirloom.

To summarize, these data strongly suggest the VPLF tradition had emerged at Lower Dover by at least 800 CE. To our knowledge, the VPLF burial tradition at Lower Dover predates the Early Postclassic Buk phase burials at Lamanai and Chau Hiix but is likely contemporaneous with the emergence of the VPLF tradition at Marco Gonzalez (Graham, 2004; Graham *et al*., 2013; Kratimenos *et al*., 2023; Wrobel & Graham, 2015). Of the twelve individuals interred in the VPLF position, two are securely dated to the Terminal Classic period. Of the other ten individuals, nine are relatively dated to the Late-Terminal Classic based on architecture and ceramics. The one outlier is BR-123 Burial 20 that dates to either the Terminal Preclassic or Early Classic based on associated ceramic vessels. Direct radiocarbon dating of VPLF burials at Lower Dover will help refine the ceramic dating and will allow us to assess whether the tradition began on the coast or inland.

Place of Origin and Diet

The $^{87}Sr/^{86}Sr$ isotope values of tooth enamel of two of the twelve Lower Dover VPLFs show that one of the individuals (BR-123 Burial 9) has a high value similar to those found near the Maya Mountains (0.709584). BR-123 Burial 23 has a $^{87}Sr/^{86}Sr$ value that suggests a local origin (0.708560), though similar values are found throughout central and northern Belize and the Yucatan Peninsula (Freiwald, 2021; Table 6). However, the isotopic diets of both individuals are similar to those published in the eastern lowlands rather than the coast, where mean $\delta^{15}N$ values can exceed + 10‰ due to the consumption of marine resources (see summary in Freiwald *et al*., 2024;197, Fig. 12.6). Inland populations, on the other hand, consumed mainly terrestrial foods, with C_4 dietary proteins making up 50–70% of the diet (Ebert *et al*., 2021; Gerry, 1997). The Lower Dover data currently are too limited to link migration or dietary differences to VPLF burial patterns (see Wrobel & Graham, 2015).

Age and Sex Distribution

The age and sex distribution of the Lower Dover VPLF burials showed high variability and was not heavily biased towards a particular biological sex or age group. The age distribution of our sample spanned from childhood to early senescence, although most individuals (16.7%) in our sample were young and middle-aged adults. This distribution may be an artifact of the sampled burial population; however, others have observed the high variability in the age distribution of VPLF burials. For example, Donis (2013) noted at Lamanai that VPLF burials ($n = 22$) were predominantly middle-aged to older adults with a minority ($n = 5$) under the age of

20, including two nonadults. This observation demonstrates that the VPLF burial pattern was not restricted to a specific age group and, thus, was unlikely to be symbolically tied to sexual maturity. The sex distribution of our sample is also consistent with that of other VPLF studies in that there is no bias towards a particular sex (Donis, 2013; Izzo, 2018), particularly since several individuals could not be assessed for sex based on their age and preservation.

Socio-political Status

The spatial distribution of Lower Dover VPLF burials indicates that the Late-Terminal Classic Maya interred their dead in the VPLF position irrespective of their status or district affiliation. The individual in the highest status context recorded in the VPLF position (CT2 Burial 1) was interred in a peri-abandonment deposit in the apex courtyard at the Lower Dover royal palace (Watkins *et al*., 2017). While the individual had dental modifications, the lack of grave accompaniments and a formally constructed grave indicates the individual may not have been part of the ruling elite (Watkins *et al*., 2017). Likewise, the two individuals placed in the VPLF position at Tutu Uitz Na (SG 1 Burial 2 Individual 1 and Burial 3) also had no associated grave goods and were placed in simple intrusive pits with no formal grave architecture. Similar to CT2 Burial 1, an individual at Tutu Uitz Na, SG1 Burial 3, had dental modification, and potentially a modified cranium. The dental and cranial modification evident in these elite contexts may hint at a certain level of affluence (Scherer, 2015:35). Nearly all the Postclassic VPLF burials at Lamanai exhibited fronto-occipital cranial modification, except one who was likely a non-local (Donis, 2013; Williams & White, 2006). Dental modifications among the Lamanai Classic Maya were also prevalent and variable, possibly reflecting a regional preference or choice of style (Williams & White, 2006). At this time, the significance of dental modifications remains unclear (*e.g.,* wealth, kinship, beautification), particularly since a single individual may have multiple types and styles of dental modifications (*e.g.,* stone inlays, filing) (Romero, 1951, 1970). Dental inlays were likely a more costly choice as an individual could have jade, pyrite, or obsidian embedded in their maxillary incisors, canines, and, in some cases, premolars after a hole was drilled through the enamel to anchor the stone. Among the Lower Dover VPLF burials, three individuals had evidence of dental modifications across the higher commoner status, intermediate, and apical elite status contexts. Similar dental modification involving the common practice of medial notching of the teeth (styles B4 & B5) was noted among the Postclassic Lamanai VPLF burials (Donis, 2013; Romero, 1970; Williams & White, 2006).

Beyond the three individuals with dental modification, the remaining VPLFs were buried in high- and low-status commoner house groups (Walden *et al*., 2023a), all with varying degrees of associated grave wealth. The only contributing factor which links the high and low-status commoner burials is the shared VPLF positioning. Other elements of funerary treatment among commoner VPLF burials are largely consistent with local and regional funerary norms which show vast variation in funerary architecture and associated grave goods (Green, 2016; Welsh, 1988). For instance, BR-82 Burial 1 is placed in a cist cut through a plaster floor with several grave goods, whereas those interred in BR-123 lacked associated grave goods (Willey *et al*., 1965:201–202). Analyses of eastern lowland burials conclude that grave goods associated with Postclassic VPLF burials were extremely variable in type, material, and quantity (Donis, 2013; Izzo, 2018), which is consistent with all Lower Dover burials irrespective of whether they were placed in the VPLF position (Willey *et al*., 1965).

Identity and Life History

A central hypothesis about the identities of the individuals buried in the VPLF position has been that these individuals may have been captives who were sacrificed (Burdick, 2016; Marcus, 1993; Spencer, 2015). This hypothesis extends from the observation that the prone position and placement of the feet over the pelvis and wrists by the sides is reminiscent of iconographic representations of captives lying face down with legs and arms bound, seemingly destined for sacrifice. Indeed, there is evidence of such treatment of individuals in the region based on iconographic depictions. For example, a stone sculpture of a bound captive from the small major center of Bacna, near modern-day Belmopan (just 10 km downriver from Lower Dover), closely resembles individuals placed in the VPLF position (Fig. 4). The monument exhibits an individual with their feet, with their feet bound over the buttocks precisely like a VPLF, but with the arms and hands positioned near the chest (Fig. 4) (Helmke *et al*., 2005: 70). Two examples from stone monuments at Tikal (Altars 8 and 10) celebrating royal accession and Katun-endings depict captives placed in a manner almost identical to that documented in the VPLF burials, with a slightly less dramatic flex in the leg but with their legs flexed over their buttocks and their hands bound behind their back (Earley, 2023; Jones, 1977; Schele *et al*., 1986). While the VPLF burials are not identical to any examples in the iconographic corpus, the range of examples in

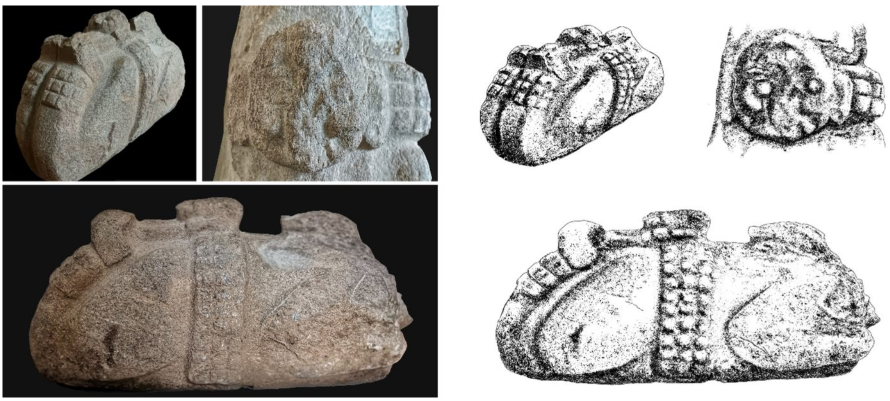

Fig. 4 Photograph (left) and illustration reconstruction (right) of the Bacna monument (photo courtesy of Abdon Tzib and Frank Tzib, illustration courtesy of Michael Biggie)

the iconography is so broad that some degree of incongruity is to be expected if the VPLFs represented captive or sacrificed individuals remains.

Based on this iconographic evidence, some have suggested that the individuals placed in the VPLF position were most likely bound or possibly wrapped prior to burial (Graham *et al.*, 2013: 174). The individuals buried in the VPLF position were likely bound or wrapped using biodegradable materials, as the weight of architectural fill would not have been sufficient to weigh the legs down in place, and the palace burial was left on the surface of the courtyard floor. The legs may have also been more easily kept in place if they had been manipulated through postmortem trauma prior to deposition. In our osteological analyses, there was no observed evidence of postmortem trauma consistent with muscle attachments having been cut in order to allow for the flexibility of the legs, although this does not exclude the possibility. Complications with identifying cut marks arise due to the taphonomic impact of the burial contexts may mar or mimic the appearance of cut marks. Alternatively, cutting could have been conducted skillfully leaving no discernable marks. In short, there is not enough evidence to support or deny this claim based on our analyses. However, our taphonomic analysis indicates that the remains were likely bound around the time of death, and our osteological analysis suggests that there was a lack of bone fractures that would indicate forced binding prior to death. Although we do not know the approximate timing of when individuals were buried after death, it is likely that any state of rigor mortis had likely passed prior to the preparation of the body. Again, we are mindful of the poor preservation and incompleteness of our sample as we note the absence of such evidence in our study.

Our findings suggest that VPLF individuals varied in terms of what skeletal lesions were present at the time of death that indicate their underlying frailty and life history. Over half ($n = 7$) of the directly observed individuals had visible skeletal lesions consistent with nonspecific markers of underlying frailty, including those indicative of episodes of childhood stress (*e.g.,* porotic hyperostosis, cribra orbitalia, and linear enamel hypoplasia). The presence of these lesions does appear to transcend social status categories as well as age and sex. Importantly, the only individual associated with a low-status commoner context that does not have evidence of paleopathological lesions is the nonadult (BR-135 Burial 1). Conversely, the other two individuals lacking these lesions (SG 1 Burial 2 Individual 1, SG 1 Burial 3) were classified as intermediate elites, which may support that higher-status individuals maintained a slight buffer against childhood metabolic stress events (Danforth, 1997; McManus *et al.*, 2022; Storey, 1997; Storey *et al.*, 2002; Wilde, 2022). Wilde (2022) similarly showed that adult individuals with linear enamel hypoplasia likely endured metabolic stress events between the ages of 2–4 years old, which is likely consistent with the age of weaning based on demographic reconstruction and modern analogues. Life history studies have shown that there are long-term health implications from childhood stress events, which includes the age of weaning and periodic childhood infections, that likely increased because of nutritional distress (Barker, 2004, 2007; Barker & Osmond, 1986).

In fact, the commonality of these skeletal pathologies may reveal a consistency among Lower Dover VPLF burials. It is worth pointing out, however, that these pathologies are not unique to individuals buried in VPLF positions and that they are consistent across paleopathological studies throughout Mesoamerica. Since the 1970s, paleopathologies like those described above suggest that these conditions (*e.g.,* physiological stress in childhood, oral health issues) were highly prevalent among agricultural populations (Saul, 1972; Schnell, 2023; Steckel & Rose, 2002). Dental pathologies consistent with an agrarian diet high in maize were the most observed among the VPLF burials but have also been noted among non-VPLF burials. By the Late-Terminal Classic, the occupants of the Lower Dover polity were heavily reliant on maize for subsistence (Ebert *et al*., 2019, 2021; Walden, 2021). This reliance is reflected by stable isotope data (δ^{13}C and δ^{15}N values of bone collagen) (Table 6), as well as the prevalence of dental caries, calculus, and, as a result, periodontal disease and antemortem tooth loss across individuals irrespective of social status. Previous paleopathological studies have suggested that the transition to agriculture decreased dietary variety and food stability during times of stress, which is particularly important for growth and development and long-term impacts on adult health and mortality (Armelagos *et al*., 1991; Steckel & Rose, 2002). Critically, most individuals within the VPLF sample were mature adults who had observable signs of physiological stress events and yet lived to an advanced age (*e.g.,* BR-123 Burial 9). Therefore, it is likely that individuals who survived stress events had lower frailty than those who died without them and at younger ages (Wood *et al*., 1992).

As such, it is unlikely that the individuals interred in the VPLF position were proportionately more frail than individuals not placed in the VPLF position since they (1) show an age distribution that trends towards the upper end of the life cycle and (2) display signs of having endured and survived episodes of childhood stress. It is crucial for this study to consider the implications of severe drought episodes that affected Maya populations in the upper Belize River Valley during the Late-Terminal Classic periods, which would have resulted in increased food insecurity (Hoggarth *et al*., 2017; Kennett *et al*., 2012). There are notable limitations to this study since the sample size is too small for an adequate paleoepidemiological model comparison. A site-wide comparison of skeletal pathologies and mortality risk of individuals interred in VPLF and non-VPLF burials, as well as by age, sex, and social status, is forthcoming.

There is a substantial amount of evidence that refutes the sacrificed captive hypothesis. While the positioning of the legs suggests individuals placed in the VPLF position were likely bound, there are plausible reasons for this treatment, such as transportation for interment. When viewed from a comparative standpoint, the captive hypothesis does not apply to later periods. For example, at Postclassic Lamanai, VPLF burials represent 33% of the studied burial assemblage, and these individuals were interred with grave accompaniments indicating reverential deposition (Donis, 2013). The fact that such a high proportion of the population was interred in the VPLF position undermines the sacrifice hypothesis to an extent. The regularity with which grave goods are placed with these individuals also undermines this hypothesis. Moreover, as our analyses have supported, the individuals interred in these positions were typical of the rest of society given the distribution of age, sex, status, and range of skeletal pathologies. Conversely, the Tutu Uitz Na and

CT2-Burial 1 VPLFs are found in contexts like the royal palace or an intermediate elite mortuary shrine where captives may hypothetically have been sacrificed (Earley, 2023). CT2-Burial 1 is in a large peri-abandonment deposit laid in the royal courtyard of the Lower Dover palace and the individuals interred atop the staircase of the eastern triadic structure at Tutu Uitz Na were placed there around 780–890 CE (the time of abandonment). Although these elite structures might have served as potential sites for binding captives and their subsequent sacrifice, the widespread occurrence of this burial practice in the commoner households of Barton Ramie challenges this assumption. Many of the Barton Ramie VPLF burials are interred alongside individuals in normative burial positions, with the body placed extended prone or supine with the head to the south, and quite often with grave goods. Moreover, like their counterparts in northern Belize and the Cayes, the individuals interred in the VPLF position at Lower Dover seem to be typical in every other way. As highlighted above, individuals subjected to VPLF burial treatment represent a range of demographic categories, are of varying statuses, ate typical diets, and experienced similar degrees of trauma and stress throughout their lives. Perhaps the only exception in this respect is the non-local status of BR-123 Burial 9, which was one of five non-local individuals from the 28 sampled individuals from the Lower Dover polity. While our sample size is relatively small, the finding that one VPLF individual was non-local is not necessarily noteworthy given the prevalence of non-local individuals in the Late Classic Belize River Valley (Freiwald, 2021).

VPLF Burial Tradition: Transportation Practicality or Emerging Mortuary Practice/Deathway

There are several alternative explanations for the emergence of the VPLF burial position that are not reliant on the possibility of individuals representing captives or sacrifice. One possibility is that the individuals were indeed bound, but for transportation, not sacrifice, and that they represent people who were moved for inhumation. This explanation is, at this point, hypothetical since we lack more concrete evidence that VPLF individuals were transported and at what distance. For example, in BR-123, there are several individuals buried in VPLF and non-VPLF positions, and they are assumed to all be members of a high-status commoner household. It is possible that those individuals buried in the VPLF position were transported to the house group for deposition but may have lived elsewhere, although this cannot be directly supported at this time.

Alternatively, this burial practice might represent an emerging type of funerary practice representative of an ideological worldview that emerged during the Late-Terminal Classic in the Eastern Maya lowlands (Wrobel & Graham, 2015). Our analyses suggest that the VPLF burial practice occurred at Lower Dover around the Terminal Classic period, prior to abandonment. Evidence from Postclassic contexts, such as at Lamanai, shows that this burial pattern persisted alongside other burial traditions and may have become more common during the Terminal Classic to Postclassic transition (Donis, 2013). It has been previously suggested that this deathway may have originated along the coast and moved inland, but our results show the inverse could just as likely be true; the earliest evidence for this burial practice was inland at Lower Dover. It is worth reinforcing that this burial practice was not solely observed in non-local individuals at these settlements, but rather, it was a practice that included locals and non-locals despite age, sex, and social status. Importantly, it may be that the emergence of burial positions reflects broader changes in regional ideological behaviors during periods of sociopolitical and, potentially, environmental change (Awe *et al*., 2023; Graham *et al*., 2017).

The Late Classic rise of the Lower Dover polity impacted pre-existing populations in different ways, local elite actors became co-opted and integrated into the polity as intermediate elites, and some commoner households saw a decline in wealth (Walden, 2021). These shifts are often reflected in the burial practices of the once-living community and that those shifts are gradual and often heterogeneous. For example, the seriation studies by Dethlefsen and Deetz (1966) demonstrated how the growing and shifting religious worldviews of the seventeenth- and eighteenth-century colonists of Massachusetts are reflected in the changes in tombstone iconography. Similarly, medieval Christians in Denmark underwent gradual changes in arm burial position from the early transition to Christianity to the Protestant Reformation (1536 CE) (Weise, 2009). Therefore, the change in burial practices, along with their diversity, may indicate a larger regional shift in ideologies during the Late-Terminal Classic period. The emergence of the VPLF position is not the only change that may support this hypothesis. At Lamanai, for example, the transition from the Terminal to the Postclassic is characterized by changes in ritual practices that accompanied the VPLF burial practice, including the increase in interring individuals in ceremonial buildings and pre-interment breakage of ceramics (Donis, 2013; Howie, 2006; Howie *et al*., 2010).

If the appearance and increasing prevalence of the VPLF burial position reflected an emerging deathway, there remains considerable ambiguity as to what that deathway may signify. It is not clear what this may mean in terms of shifting beliefs and its coexistence with other ideologies since it is obvious that the VPLF position was one of several burial positions that continued from the Late Classic to the Postclassic periods. In any case, we no longer observe this burial pattern in Lower Dover after the site's Terminal Classic abandonment, despite the presence of Postclassic burials in the region (Hoggarth *et al*., 2021). The underlying reasons for the polity's depopulation, as well as that of the region, are still under investigation. Evidence suggests that the region experienced significant depopulation and decentralization of major political centers by the end of the Late Classic and that this may coincide with recurring severe drought periods (Hoggarth *et al*., 2017). Is it possible that the emergence of the VPLF position in the Terminal Classic period is linked to the increasing sociopolitical tensions and environmental stressors brought on by drought? Certainly, mortality patterns can change in light of external stressors on population health and well-being, as well as the disintegration of political and social structures (Hoggarth *et al*., 2022). However, this claim requires an evaluation of burial patterns across the region along with integrating more lines of evidence.

Considerations and Future Work

Ultimately, VPLF burials form 11% of the burial assemblage at Lower Dover, and this may reflect the importance of this mortuary practice to the Late and Terminal Classic occupants of the polity. It also remains plausible that our awareness of the VPLF trend at Lower Dover is the result of the scale of excavation conducted at the polity. A total of 98 household groups (27% of settlement) within the polity have been excavated. Analysis has been conducted on approximately 100 individuals from these residential contexts, including those in this manuscript. From this sample alone, it is clear that there is variation in burial practices across the polity, particularly with the burial positioning of the body; thus, there is considerably more work to be done. This work includes the application of more rigorous methods to assess the paleodemography and paleoepidemiology of the Lower Dover samples that account for the inherent biases of skeletal assemblages, namely selective mortality, age filtration, and missing data (Boldsen *et al.*, 2022; Kelmelis & Price, 2022; Milner *et al.*, 2021; Milner & Boldsen, 2017; Wood *et al.*, 1992). Skeletal samples are inherently biased because they are samples of the dead that have undergone a lengthy selection process from death to discovery. Further, those individuals are inherently frail and have several sources of unknown heterogeneity that contributed to their risk of disease and death. Future analyses will include applying aggregated data for all analyzed burials into parametric hazard models to estimate the force of mortality for individuals with various observed characteristics (*e.g.,* paleopathologies, skeletal modifications, burial position, demographic variables) compared to their age peers without those characteristics to understand differences in life history experiences and mortality risk. Using novel approaches while also integrating known issues like missing data, which is frequently the case in bioarchaeology with remains from varying taphonomic contexts, will allow for a more thorough and insightful exploration of these questions that has yet to be undertaken for the Lower Dover polity.

Ongoing aDNA work as part of the Ancient Maya Kinship project will hopefully provide a clearer idea of how the individuals interred in the VPLF position at Lower Dover were biologically related to those individuals interred within the same household structures. If the VPLF individuals are discovered to have been closely related to non-VPLF individuals in the same residential structures, then this could challenge the nonlocal captive sacrifice hypothesis, specifically with regard to the idea that the Maya were capturing and sacrificing nonlocal individuals captured during interpolity conflicts (Earley, 2023; Halperin, 2023; Harrison-Buck *et al.*, 2007; Helmke, 2020; Kim *et al.*, 2023; Miller & Brittenham, 2013; Price *et al.*, 2019; Serafin & Peraza Lope, 2007; Storey, 2014; Tiesler, 2007; Webster, 2000; White *et al.*, 2007). Strontium and oxygen isotope analyses of skeletal remains recovered at the Sacred Cenote of Chichen Itza, Mexico, for example, revealed that individuals who may have been sacrificed originated from different parts across Mexico and possibly in Maya-occupied areas beyond (Price *et al.*, 2019). A more recent study using aDNA showed that many individuals in a subterranean sinkhole near Chichen Itza were likely related and shared genetic signatures with present-day peoples in the region (Barquera *et al.*, 2024). In an isotopic study of sacrificial victims interred at the Teotihuacan Moon Pyramid and Feathered Serpent Pyramid, White and colleagues

(2007) found that individuals differed in their patterns of movement prior to death with several originating from the area while others possibly having traveled as far as from the Gulf Coast or Maya lowlands. These studies may indicate that there is a more complex story about the identities of captive individuals and concepts of intergroup conflict among the Maya than originally speculated. With this in mind, we are hopeful that further radiocarbon dating and strontium and oxygen isotope analyses will further elaborate on the migratory status and identities of individuals interred in the VPLF position.

Conclusions

This study represents the first to draw from archival, archaeological, osteological, and chemical sources to reconstruct the identities of individuals buried in the VPLF position within the Lower Dover polity. Through this work, we critically assessed the hypothetical undertones of the emergence of the VPLF position during the rise and fall of the polity and linked this tradition to broader trends in the region. The practice of burying the dead in the VPLF position had clearly begun at Lower Dover by the Late Classic period. From 600 to 900 CE, individuals of varying ages, sexes, and statuses were interred in the VPLF position at Lower Dover. Most of these individuals seem typical of the broader population at this time given age, sex, and locality, suggesting that the VPLF mortuary practice was not specific to a certain sector of society but was an alternative deathway treatment. The question of what the VPLF position represents remains far from clear, although evidence to suggest that individuals placed in the position reflect sacrificed captives is dubious. Importantly, the integration of archaeological and curatorial contextual data plus a thorough analysis of the funerary and non-anthropogenic taphonomic influences on the VPLF burials has provided a more solid evidence base for supporting or refuting claims about their identities in life and death.

The importance of considering the taphonomic histories of archaeological remains cannot be overstated as the social process of death is continuous as the living continue to interact with the dead in variable ways (Duday, 2009; Kellehear, 2007; Robb, 2013). Within this sense, the VPLF burials of Lower Dover continue to experience the process of death from their interment, discovery, and continuous study. It is likely that the Late-Terminal Classic appearance of the VPLF burial complex at Lower Dover (and the eastern Maya lowlands more broadly) is tied to ideological transitions associated with this period of intense social and environmental change, thus providing us a perspective on local death practices in response to shifting biological and social circumstances (Awe *et al.*, 2023). Funerary taphonomy and taphonomic exploration of post-excavation alterations of human remains can give us unique insight into these past practices that cannot be fully appreciated otherwise. It can equally raise controversial and humanistic discussions about the treatment and reconstruction of past human lives and identities. Knüsel and Robb (2016) eloquently describe how human bodies are the embodiment of human stories, including that of the individual and those who have had a lasting impact on them. In this way, biocultural perspectives about funerary taphonomy provide a more detailed understanding of human stories from those transitional moments from life to death and beyond. Centrally for this study, a biocultural approach to deathways that includes the longitudinal taphonomic legacy of the remains may reveal a broader understanding of the role of VPLFs in the Terminal Classic period in the Upper Belize River Valley and, in a poetic way, continue their social life with descendant communities through public archaeological engagement. The social life of remains is contingent on taphonomic forces, for better or for worse.

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Author Contribution S.K., J.W., K.G., J.H., C.F., and V.I. conceptualized the topic. S.K., J.W., K.G., J.H., C.E., C.F., M.B., A.T., T.W., V.I., and R.G. are responsible for the methodology. S.K. and K.G. are responsible for the formal analysis. S.K. is responsible for the archaeothanatological analysis. Resources were led by J.H., C.E., C.W., and J.A. Project administration was led by J.A., J.H., C.E., J.W., and R.G. S.K., J.W., and K.G. wrote the main mauscript text. S.K. and K.G. wrote the Supplemental Materials. J.W. prepared Figs. 1–3 and M.B. prepared Fig. 4. S.K. prepared tables 3, 4, 5, 8, and 9; J.W. prepared tables 1, 2, 5, and 7; K.G. prepared tables 5–7; J.H., C.E., C.F., and V.I. prepared tables 5 and 6. All authors reviewed the manuscript.

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Data Availability Data is provided within the manuscript or supplementary information files. Additionally, all data summarized herein is freely accessible for download through the University of Pittsburgh Center of Comparative Archaeology.

Declarations

Ethics Statement The research was conducted under the auspices of the Belize Valley Archaeological Reconnaissance (BVAR) Project. Since its founding by Awe in 1987, BVAR has engaged with the communities of Western Belize, featuring Belizean directors, indigenous senior personnel, and collaborations with local heritage groups and educational institutions (see Hoggarth *et al*., 2020b). The Belizean community and descendant Maya communities actively participate in project research, influencing the types of questions posed and the approaches employed. Bioarchaeological research conducted by the BVAR Project has been discussed with local indigenous Maya communities as part of a consultation process led by Walden and F. Tzib. Belizean students received basic training in osteological and laboratory methods during work at the Harvard Peabody Museum of Archaeology and Ethnography. The research received approval from the Belizean National Institute of Culture & Heritage – Institute of Archaeology (NICH-IA) and passed the ethical review process at the Harvard Peabody Museum of Archaeology and Ethnography. This study incorporates research from previous analyses conducted under the ethical permissions of these same institutions. The researchers on this project aim to treat the human remains with the utmost respect. Data collection procedures adhered to institutional ethics guidelines and were conducted under the supervision of collections staff to ensure best practices. Data has been shared directly with these institutions, and results will be communicated to local descendant/stakeholder communities in Belize in early 2025.

Competing Interests The authors declare no competing interests.

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