What Hope Lies Buried Here: Differential Mortality and Mortuary Treatment of Adolescents in Dubuque's Third Street Cemetery

Submitted by Jennifer Eileen Mack to the University of Exeter
as a thesis for the degree of
Doctor of Philosophy in Archaeology
In July 2020

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I certify that all material in this thesis which is not my own work has been identified and that no material has previously been submitted and approved for the award of a degree by this or any other University.

Signature: Jennifer E. Mack ……………………………………………...

Abstract

Excavations at the Catholic Third Street Cemetery in Dubuque, Iowa, uncovered 939 unmarked graves dating to the period between 1833 and 1880. Skeletal analysis identified 43 individuals whose age estimate ranges overlapped with osteological (12 to 20 years) and social (13 to 19 years) adolescence, as defined for this cultural context. The current research design focused on mortality patterns and mortuary preparations of these individuals and highlights differences between teenagers and the rest of the cemetery population. This interdisciplinary project utilised data from osteological analyses and archival research to explore health and mortality among adolescent non-survivors. Palaeopathological observations reflecting early life health insults (linear enamel hypoplasias, cribra orbitalia, porotic hyperostosis) and later illness (labyrinthine endocranial lesions, periosteal new bone formation, tubercular lesions) were studied to explore the potential vulnerability of adolescents with frailty acquired through earlier health stresses. Perimortem trauma and local death records were examined to determine the proportion of teenage mortality due to external causes such as accidents, homicide, and suicide. The lack of perimortem trauma observed in the Third Street adolescent sample was explained to some extent by the number of teenagers who perished from, but were unmarked by, a single accidental cause – drowning. The investigation of mortuary treatment examined combinations of burial attributes – including coffin hardware, burial clothing, religious objects, and nonreligious grave goods – and demonstrated how age-related patterns reflect an increase in socially acceptable sentimentality and changing views of the afterlife, with preferential treatment afforded to some adolescents.

Comparative pathological marker and burial attribute data were gathered from publications on nine additional nineteenth-century burial populations, and death records from a tenth were consulted. Despite issues with inconsistent data collection procedures for parts of the comparative sample, results tentatively support the observations from Third Street. The proportion of adolescents with both early-life stress markers and later pathological manifestations is higher than that of other age classes, suggesting that survival of health insults in infancy or early childhood left teenagers more susceptible to fatal disease, particularly when their immune systems were vulnerable due to competing pubertal energy investments. Observed regional

differences in skeletal marker rates suggest that this “double signal” may be more pronounced in populations with a high prevalence of TB. Perimortem trauma levels are equal to those of adults, though greater evidence of violence in the South and Southwest reflects the unstable social conditions in those areas. Regional, as well as temporal, trends were also identified in adolescent funerary preparations. Mid-nineteenth-century adolescents received preferential treatment, though general increases in mortuary elaboration overshadow this distinction in some later cemetery populations. Parental grief at the loss of near-adult offspring was expressed in the tendency to employ the metaphor of death as a journey when preparing adolescents for the grave, instead of the metaphor of sleep applied to younger children. Meanwhile, in frontier areas, independently living teenagers were often interred without familial involvement in the equivalent of paupers’ graves.

Acknowledgments

I am most indebted to my advisers at the University of Exeter, Dr. Catriona McKenzie and Dr. Laura Evis, for their knowledge, support, and guidance through this long and unfamiliar process. Special thanks also go to Professor Alan Outram, who encouraged me to do this ages ago, and Professor Linda Hurcombe, whose suggested PhD research timetable I followed rigorously, with great success! I also benefitted from input offered by Professor Naomi Sykes and Dr. Hajnalka Herold, who reviewed my work at the end of year one. I am grateful to the College of Humanities for the Exeter International Excellence PhD Scholarship which funded my research.

The University of Iowa and the Iowa Office of the State Archaeologist provided unwavering support and unfettered access to data and resources, for which I am truly grateful. Thank you to State Archaeologist John Doershuk and Bioarchaeology Program Director Lara Noldner for your support and encouragement. And thank you to archaeologists Bill Whittaker and Angela Collins for your help with various computer programs!

Special thanks go, of course, to the director of the original Third Street Cemetery project and co-author of *Dubuque's Forgotten Cemetery: Excavating a Nineteenth-Century Burial Ground in a Twenty-First-Century City*, Robin M. Lillie. None of this would have been possible without her. May she rest in peace. I would also like to extend thanks to the entire field and lab crew – too numerous to list here – from the original project. You know who you are! A nod should go to A.J. Spiegel, as well, for funding, however grudgingly, the Third Street excavation.

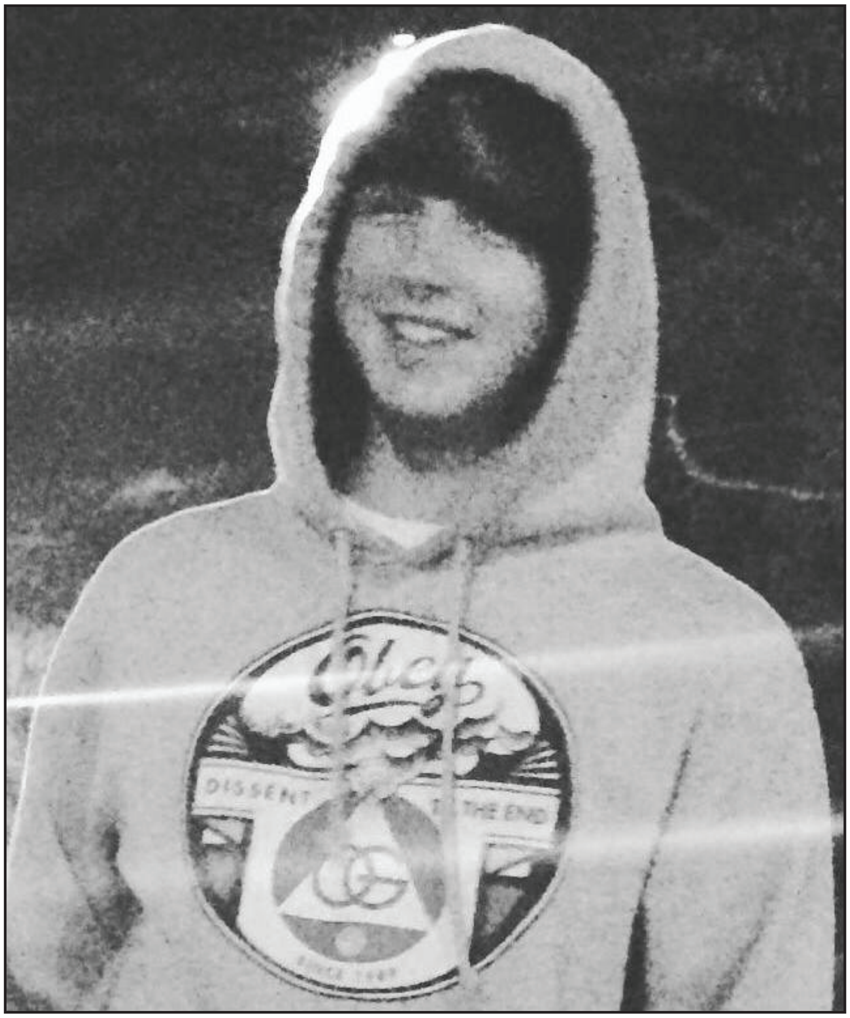
A number of Dubuque historians helped me with both the original research project and the new research conducted for this thesis. Chief among them is Biays Bowerman, who was incredibly generous with his time, even when he had very little left. *Requiescat in Pace.* Tom Schlarman also willingly shared the fruits of his years and years of data collection, for which I am extremely grateful. May the Phoenix Group genealogical society continue to write the fascinating history of everyday Dubuquers. I owe an enormous debt to Mike Gibson, Director of the Center for Dubuque History at Loras College, who maintains an impressive and comprehensive archive. Many thanks to the staff at the Carnegie-Stout Library in Dubuque, as well, and to Kristin Glomstad, Collections Manager and Registrar of the Captain William D. Bowell, Jr., River Library and Archives at the National Mississippi River Museum and Aquarium. Also, thanks to the descendants of Josiah Conzett who have made his entertaining and largely uncensored memoirs available to the public online. I am grateful to the State Historical Society of Iowa for awarding me the 2018/2019 SHSI Research Grant, which funded much of my research on social adolescence in Dubuque.

My study of the comparative cemeteries began with a review of published materials, and I thank all the excavation report and chapter authors, again too numerous to list here. Thank you to Scott Pletka (Texas DOT), Kara Russell (Pennsylvania DOT), and Mark Shaffer (Pennsylvania Historical and Museum Commission) for sending me copies of hard-to-find reports. Invariably I had to request additional data, which many researchers generously provided. Special thanks to Dr. Anne Austin of the University of Missouri-St. Louis and her students Shawn Edgehill and Kathleen Rice for the LEH data they provided for the Second Catholic Graveyard. And undying gratitude to Beckie Dyer and DeeAnn Watt, of the Illinois State Museum, and Jason King of the Center for American Archaeology at Kampsville, for tracking down and scanning the original analysis forms for Grafton Cemetery. Dr. James Davidson and Jeremy Pye were incredibly kind to share both their spreadsheets and their insights, particularly concerning coffin hardware. Larry McKee also shared spreadsheets full of unpublished data from the fascinating cemetery project we worked on together in Tennessee. Cindy Munoz and Raymond Mauldin with the Center for Archaeological Research at the University of Texas-San Antonio were also kind enough to share unpublished information related to their cancelled Campo Santo project. Dr. Patricia Richards, University of Wisconsin-Milwaukee, generously opened her lab and her Milwaukee County collection to me. Many thanks to her and to her students Lori Critcher and Shannon Kate Freire. I'd like to express gratitude to Cannon Daughtery and Ian Milliken of the Pima County Cultural Resources & Historic Preservation Division, and Dr. James Watson of the Arizona State Museum for granting me access to non-public data from the Alameda-Stone project, and to Patrick Stanton, SRI, Inc., for trying so hard to track down that data for me! Finally, for their help with my investigation of burial clothing, I thank Deborah Welker, Persephone Hintlian, and Jack Mord, founder of The Thanatos Archive.

To the field and laboratory crews on all the projects I referenced in this work – I may not know your names, but I deeply appreciate your work. Please don't be offended if I disagreed with your interpretations.

There is no way I can express adequate appreciation for my family. Thank you to my parents, Diane and Ronald, whose emotional and logistical support allowed me to play shovelbum for so many years before settling down to this labour of love, and who helped out in so many ways, from proof-reading services to firearms consultations. My grandmother Veronica Pioro kept me well supplied with cookies and treats to get me through many, many hours of writing. To Maureen and Ken, for opening their home to me at the beginning of this adventure, I am eternally grateful. Many thanks, as well, to my nephews, Jason and Duncan, my niece Annika, and my stepson Dylan for providing opportunities to observe living teenagers! And, of course, to my littlest niece MacKenzie for bringing me sheer joy and a welcome distraction.

To my best friend Courtney who has listened to me yammer about Third Street and Dubuque for over 12 years, thank you for your patience! And to my husband Dustin, who has suffered through every moment of the process with me, thank you for being the best research assistant/chauffeur/snow-blower/fire-starter I could ever hope for. The success of this project would not have been possible without your support!



Dedication

The thousands of hours put into this thesis are dedicated to my nephew, Jason Ender West, who was taken from his family just weeks after his 18th birthday in 2016. The loss of that bright and enterprising young man, who was poised to do so many adventurous and interesting things, engendered in me a deeper understanding of this volume's subject matter, without which the research would have been merely a mechanical exercise in pursuit of a piece of paper.

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Chapter 1

Introduction

Adolescent burials provide a wealth of evidence concerning the health of the populations they represent and the age-related social structure of their respective cultures. Due to the relative rarity of such burials, however, adolescent mortality is infrequently studied in prehistoric and historic populations; teenagers, having survived the vulnerable periods of infancy and early childhood, are believed to enter the archaeological record in low numbers (Baxter 2019:143; Lewis 2007:186). The circumstances which transform these adolescent survivors into non-survivors are of particular interest, then, not only in the nineteenth-century American populations explored in this thesis, but also in other past societies and in the United States today, where the disproportionately high rate of adolescent deaths due to external causes (e.g., accidents, homicide, and suicide) is the subject of numerous social prevention studies (Berman *et al.* 2006; DiClemente *et al.* 2013; Kochanek *et al.* 2016; Miniño 2010; Taylor *et al.* 2007). Mortuary treatment of adolescents is another subject of both archaeological interest and contemporary relevance, as the high-visibility adolescent funerals and memorials that have become common in modern America may have roots in practices which emerged in the nineteenth century, when cultural shifts caused Americans to reimagine the afterlife (Haney *et al.* 1997; Reid and Reid 2001).

The following study focuses on the mortality patterns and mortuary treatment of teenagers buried in a nineteenth-century Catholic graveyard in Dubuque, Iowa – the Third Street Cemetery (ca. 1833-1880) – which was excavated in the early 2000s to make way for land development. The interdisciplinary research presented here integrates data from osteological and material culture analyses with information from archival sources to highlight the differences between these adolescent individuals and the rest of the Third Street Cemetery population. Archaeological reports from ten additional nineteenth-century American cemeteries provide comparative data to determine how the differential mortality and mortuary behaviour observed for adolescents at Third Street fit into regional patterns of health, national culture, and religious beliefs.

1.1. Adolescence in America

Adolescence is a unique stage in the human life cycle. Biologically, adolescents are subadults, whose bodies are still growing and changing. Most osteological texts frame adolescence as the age between 10 or 12 years and 18 or 20 years, though dental and skeletal growth and fusion may continue into the mid-20s (AlQahtani *et al.* 2010; Baker *et al.* 2005; Buikstra and Ubelaker 1994; Cunningham *et al.* 2016; Schaefer *et al.* 2009, White *et al.* 2012). Socially, adolescence is more difficult to delineate, and varies between cultures. Broadly speaking, social adolescence may be defined as a period during which an individual is given some of the responsibilities of adulthood (e.g., employment) but not others (e.g., marriage). Lewis *et al.* (2016a:48) define adolescence as the transitional stage between childhood dependency and adult independence, signalled in the historic period by the observable changes wrought by puberty more than by chronological age. From an economic perspective, modern adolescence may be viewed as the maturation of a long-term investment by the family, which has supported a child until the point when he or she can become a contributing member of society (Riney-Kehrberg 2000:116-117).

How was adolescence regarded in the nineteenth century in the United States? The word "adolescence" was rarely used prior to 1900, and academic interest in the social experience of adolescence only emerged in the twentieth century, due to "a yawning time gap between the onset of sexual maturity and the full incorporation of young people into the economic life of the adult world (Kett 1971:283)." However, the concept of a transitional stage after childhood – with individuals referred to simply as "youths" – is observable in American literature beginning in the early 1800s. Biographies began to address the early lives of their subjects, and a new class of books, containing "advice to youths," appeared (Kett 1971:286-287). Factors which contributed towards this new interpretation of the human life cycle include greater biological knowledge and the urbanisation of America (Kett 1971). In a rural environment, where the family is the working unit, separation of age groups is less important than it is in an urban setting (Demos and Demos 1969). Kett (1971) also credits the evangelical movement and the Second Awakening, which greatly encouraged youthful religious conversions, with the establishment of American adolescence as a distinct social stage characterised by both freedom of choice and emotional instability (Burr 1887; Demos and Demos 1969; Hall 1904; Mintz 2004:88). This stage encompassed the mid-teens to the mid-twenties in the early nineteenth century, but by the 1870s referred mainly to the teenage years (Kett 1971:293). Demos and Demos (1969) demonstrate that the rise of the modern concept of adolescence was a response to fundamental changes in urban American families, including a new age-group discontinuity and the decline of the economic role of young people in an industrial society.

Note that both Demos and Demos (1969) and Kett (1971) drew exclusively upon East Coast sources for their research on the subject of American adolescence. Indeed, most contemporary publications about childhood and child-rearing originated from the upper and middle classes in the Northeast (Baxter 2019:23). The extent to which the changing social norms of the long-established Protestant society in New England affected the perspectives of the largely immigrant Catholic community in Dubuque has not previously been addressed. Thus, the results of a community-specific study of adolescence are presented in Chapter 6.

1.2. American Mortuary Customs and the Beautification of Death

The nineteenth century was a period of transformation for American mortuary customs. In *Inventing the American Way of Death, 1830-1920*, James Farrell (1980) chronicles the gradual removal of mortuary preparations from the private home and the establishment of the institution of the funeral home. Like most American trends, changes in attitudes towards death and the customs that surrounded it first took hold on the East Coast and slowly spread westward across the country. Thus, the reimagining of the American cemetery and the ascension of the undertaking profession, trends which began in Massachusetts in the early 1800s, did not reach frontier communities in the Midwest until the second half of the century (Bell 1990; Farrell 1980; Goldstein and Buikstra 2004). The Third Street Cemetery was founded in the 1830s, at a time when many American burial grounds resembled the overcrowded churchyards of Europe (Lillie and Mack 2015:23-27). The first funeral home in Dubuque was not established until 1882 (Mack 2013c:76-8).

The Beautification of Death trend, on the other hand, which sprang from the Romanticism of the late eighteenth century, had clearly reached the Midwest during the active period of the Third Street Cemetery. The influence of this ideological and commercial movement, which idealised death and the afterlife, is evident from nineteenth-century grave markers still standing in cemeteries in Iowa and other states west of the Mississippi River. Nowhere are seen the skeletons, scythes, and winged skulls so popular in America through the eighteenth century. As seen in Figure 1.1, these grim images were replaced by visually-pleasing iconography with classical, biblical, and natural themes, as death was reimagined as gateway to a joyful and comfortable afterlife (Bell 1990:57; Pike and Armstrong 1980:16-17).

The same themes and imagery were incorporated into coffin hardware items, as advances in mass production capabilities brought decorated coffins not only into vogue, but within reach of the middle class, and even people of lower socioeconomic status (Bell 1990; Springate 2015). The improvement of long-distance transportation networks in the mid-nineteenth century brought coffin hardware to markets serving the bereaved in the Midwest (Connolly *et al.* 2010; Springate 2015:58).

Through the early nineteenth century, most individuals in America were buried in shrouds, which were long, plain gowns, sometimes knotted at the feet. By the end of the century, though, it was common to bury the dead in their best clothing (LeeDecker 2009). Sometimes burial clothes were obtained specifically for the funeral, either manufactured by the family or purchased through the same catalogues that offered coffin hardware (Lillie 2013c:221; Welker 1999). The Beautification of Death eventually extended to the beautification of the corpse, as funeral cosmetics came into use in the late nineteenth century (Farrell 1980:161).

Though these outer trappings were, to some extent, associated with the rise of a new commercial industry, they were also the result of changing ideas about the remembrance of the dead, which allowed for greater public expressions of sentimentality, prolonged mourning, and the romanticising of death and heaven. In earlier periods of American history, funeral customs focused on the community's sense of shared loss. In the nineteenth century, greater emphasis was placed on the soul of the deceased, and it became the duty of the immediate family to mourn both formally and publicly (Bell 1990; LeeDecker 2009; Lillie and Mack 2015:23; Pike and Armstrong 1980:15-18; Springate 2015).

Figure 1.1. Two photographs demonstrating shifting preferences in American funerary art. Winged skulls ornament mid-18th-century grave markers in Boston's Copp's Hill Burying Ground (top), while headstones moved from the Third Street Cemetery, dating to the 1850s-1860s, are adorned with natural and classical imagery, as well as religious iconography (bottom). Photographs taken by the author.

1.3. The Third Street Cemetery, Dubuque, Iowa

From around 1833 until 1880, the members of St. Raphael's Cathedral, a largely Irish parish in Dubuque, Iowa, interred most of their dead in the Third Street Cemetery (Site #13DB476), situated on a lead-bearing bluff overlooking the town and the Mississippi River to the east (Figure 1.2). This active-use period of the cemetery spans the earliest American pioneer settlement of the area, the explosion of growth due to mining and timber industries, and the urbanisation of Dubuque. In the century after the Catholic graveyard fell out of use, the existence of the burials was gradually forgotten, due to the mistaken local belief that the graves had been moved. Few above-ground indications of the cemetery remained in the twentieth century, with the fence having long since disintegrated and most of the headstones having disappeared. Thus hundreds – or, more likely, thousands – of burials were inadvertently disturbed and removed during construction projects on two separate portions of the property in the 1940s and 1970s. With no laws yet in place to protect unmarked historic-period burials in Iowa, these incidents were kept quiet (Mack 2013a:27-61).

In 1994, four additional graves were disturbed during the installation of a retaining wall at the base of a slope adjacent to one of the previously bulldozed areas. In the years since the prior disturbances, Iowa's Ancient Burial Protection Law (Iowa Code, Chapter 263B.7 and 716.5) had been passed. This law gave jurisdiction over the burial site and human remains to the Iowa Office of the State Archaeologist (OSA) and the Iowa Department of Public Health. These agencies determined that the already-damaged graves should be excavated archaeologically, with the remains to be reburied in the modern Catholic cemetery south of town, Mt. Olivet. At the time of the excavation, OSA archaeologists discussed the likelihood of intact burials on an adjacent property at the top of the slope, then owned by the Sinsinawa Dominican Sisters. Unfortunately, their concerns were not shared with the Sisters or the city planning office at the time (Mack 2013a:54-56).

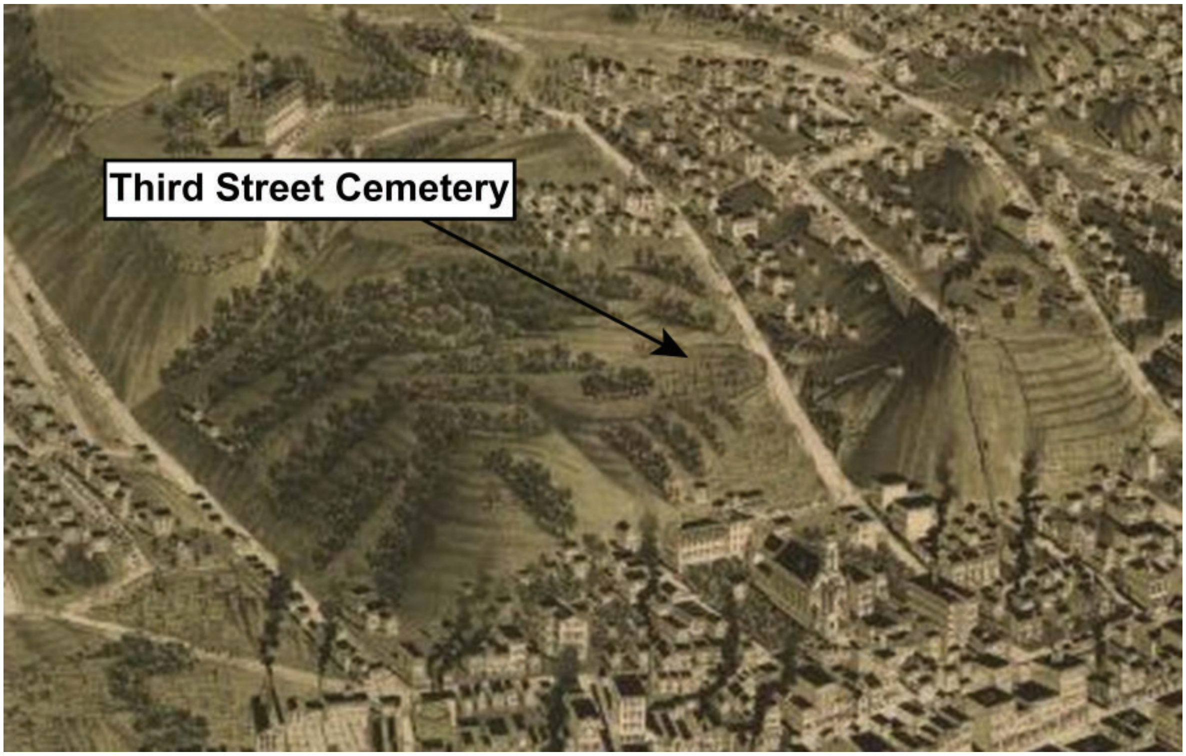

Figure 1.2. Detail from the Perspective Map of the City of Dubuque *sketched by H. Wellge, ca. 1889. Original in the Library of Congress Map Collections.*

In 2002, the Dominican Sisters sold their property to a private land developer. Earth-moving in advance of condominium construction in 2007 once again disturbed human remains. The OSA was retained by the land developer to remove all the graves within the construction project area (Figure 1.3). The archaeological recovery, which lasted from 2007 to 2011, resulted in the excavation of 935 burials, though the project area only included approximately one-fifth to one-fourth of the former cemetery. Forty-three of these individuals were determined to be osteological adolescents aged 12 to 20 years (Appendix A). Like nearly all excavations of historic-period cemeteries in the United States, the work was conducted as a compliance project, rather than an academic venture, with no particular research questions and no objective other than the removal of the graves. In accordance with the Iowa Code, basic analysis of the human remains and artefacts was conducted at the OSA laboratories, following the agency's established data collection protocols, before the materials were reburied in Mt. Olivet Cemetery in 2013 (Lillie and Mack 2013). The author of the current study participated in the excavation and the analysis of skeletal and artefactual materials as a member of the OSA Burials Program from 2008 to 2013. The current research project, using data from the original analysis, was begun in 2017.

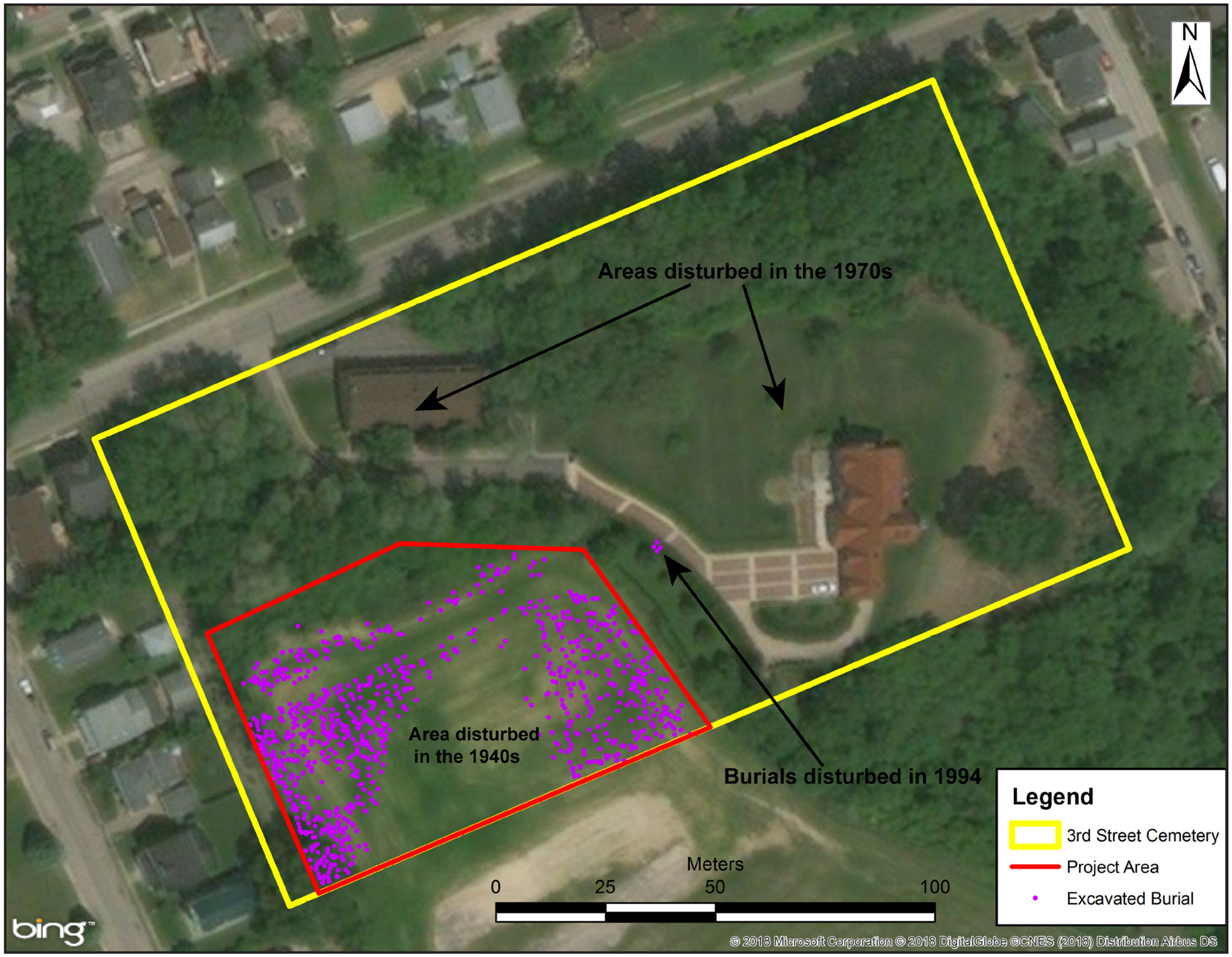

Figure 1.3. Aerial photograph of the Third Street Cemetery, showing the graveyard boundaries (yellow), the 2007-2011 project area (red), and the locations of the excavated burials. Also shown (black arrows) are the areas where graves were disturbed in the 1940s, 1970s, and 1994. Base map: Bing Maps, Digital Globe, 2018.

1.4. Research Questions

During the fieldwork and subsequent analysis of materials from the Third Street Cemetery, two interesting features were noted among the adolescent graves. The first observation was the lack of perimortem trauma among the teenagers. This absence seems surprising, given the many contemporary local newspaper articles which report the deaths of young men in various accidents. The second attribute of note was the presence of nonreligious grave goods in some of the adolescent burials. As the Catholic Church strongly discourages the inclusion of worldly goods in the coffin, most of the artefacts found in the graves at Third Street were apparel-related items or religious objects (rosaries, saint's medals, etc.). Secular items such as scissors or coins were rare and were often accompanied by evidence that the deceased was buried in clothing composed of multiple garments, perhaps representing the teenager's "Sunday best," rather than a gown or shroud. These observations, which served as the inspiration for this research project, raised a number of questions regarding medical history in the Midwest and the United States at large, and concerning the ways in which mortuary behaviour reflects changes in American culture and popular religious beliefs in the nineteenth century. The questions explored in this thesis are:

1) What were the leading causes of death for adolescents buried in Dubuque in the nineteenth century? How does the distribution pattern for adolescents differ from that of adults, young children, and infants in the same population? Does the distribution pattern differ for male and female adolescents? These issues are explored using both osteological evidence and archival records.
2) Do the nonreligious grave goods and elaborate burial outfits observed in some adolescent graves represent special mortuary treatment for individuals who died on the verge of adulthood? Distributions of these items, and of decorative coffin hardware and religious grave goods, are examined for patterns relating to the age of the deceased.
3) Are the patterns of mortality observed for adolescents in Dubuque reflected in other nineteenth-century cemeteries in the Midwest and in other regions of the United States? Data for these and other comparisons are taken from

the archaeological reports and historical background research on ten recently excavated burial grounds.

4) Can the health status of adolescent non-survivors inform understanding of overall population health and/or life-course fluctuations in disease resistance? This issue is explored by examining the co-occurrence of early-life and perimortem pathological markers.
5) Is differential mortuary treatment for adolescents evident in other Catholic cemeteries? Can differences between the treatment of adolescents and others be detected in Protestant cemeteries where the inclusion of secular grave goods is more common? Are similar trends evident in burial grounds serving African-American, Hispanic, and historic-period Native American communities?
6) Is there any evidence of differential treatment of adolescents in institutional cemeteries? Since these bodies were prepared by professionals contracted to provide the bare minimum required for a "decent burial" (Richards 1997), rather than being prepared under the direction of the family, any special treatment may be indicative of community-wide feelings concerning the loss of the individuals at a crucial stage in life.
7) Are there any differences in the mortuary treatment of adolescents based on the manner of death? As exact cause of death could not be pinpointed for most excavated individuals, the categories used for this evaluation are external causes (perimortem trauma) and chronic illness.

1.5. Organisation of Thesis

This thesis will provide new data to explore the health history of America's Midwest during the transition from the pioneer period to early urbanisation, and will examine variations in mortuary treatment observed despite the "remarkable uniformity" of American funerals noted by Huntington and Metcalf (1979:187), while focusing on a specific youthful subset of the population. For background, Chapter 2 explores the history of American cemetery excavations and previous research concerning American burial practices in general and Catholic traditions in particular. This chapter also presents recent studies of adolescent status and burial treatment in other regions of the world. Chapter 3 provides historical context, placing Dubuque and its Catholic population within the larger framework of the American Midwest. The chapter also introduces both the primary sources used for archival research and the contemporary cemeteries chosen to provide comparative data. In Chapter 4, the key palaeopathology concepts relevant to this project are discussed, along with previous studies of adolescent health and mortality.

Chapter 5 presents the materials and methods used, including the original osteological analysis of the primary sample population, and explains the database created to record osteological observations and burial attributes. This section also provides information about sample selection criteria and the types of statistical analyses performed. Chapter 6 addresses the status of American adolescents in the nineteenth century and establishes the age range of social adolescence within the community of Dubuque.

Chapters 7 through 10 present the results of analysis. Chapter 7 illustrates pathology and mortality trends for adolescents in the Third Street Cemetery and Dubuque, while Chapter 8 presents findings for the comparative samples. Chapters 9 and 10 describe age-based mortuary treatment patterns at Third Street and at the comparative cemeteries, respectively.

Chapter 11 provides a discussion of overall temporal and regional trends and the social implications of these, both in the past and in modern America. Finally, Chapter 12 summarises the work and provides answers to the questions posed in the section above.

Though the focus of this thesis is the population of the Third Street Cemetery, the patterns revealed by the comprehensive study of over 5,000 graves from across the United States have further-reaching implications, and the methodology is applicable to other archaeological contexts. A truly interdisciplinary effort, this project not only combines the methodologies of human osteology, archaeology, and history, but also satisfies the entreaty put forth in Deagan's (1988) seminal work on historical archaeology, by asking questions that can only be answered by a multi-evidential approach. Furthermore, the research makes use of datasets that are often ignored or inaccessible, those found in reports produced by private sector compliance archaeology.

I. BACKGROUND

Chapter 2

American Cemetery Studies: Cultural History and Archaeology

2.1. A History of American Cemetery Studies

Though Native American burial sites have aroused interest since the earliest days of archaeological explorations in the New World, the scientific excavation of non-Native graves in the United States is a relatively new phenomenon, beginning in the 1970s and becoming increasingly common in recent years (Davidson 1999:2). Subsequent to the enactment of the National Historic Preservation Act of 1966, similar state, county, and municipal laws were passed which provide for the preservation of historic properties and the protection of human remains (Crow 2004:4). Prior to this, the removal of both marked and unmarked non-Native American cemeteries was usually undertaken at the discretion of the local department of public health and overseen by funeral directors (Mack 2013a:43-54). Newer laws require that excavations of historic cemeteries be performed by qualified archaeologists and/or human osteologists, if removal is justified and if the graves are of a determined age. The age at which a burial is considered “historic” varies depending on the jurisdiction, with some states applying the label at 50 years and other demanding that a grave be greater than 150 years old (e.g., Florida Statute XLVI, 872.05; Iowa Code 263B.7; Texas Historical Commission 2001:3). Thanks to these regulations, an increasing number of burial grounds have been carefully excavated and documented in the last 50 years, though the work has sometimes been criticised for lack of in-depth analysis, due to the financial and time constraints imposed by compliance archaeology (Davidson 1999:2-6).

Another criticism of early historic cemetery projects is that their analyses employed the same methods utilised in prehistoric mortuary investigations rather than taking advantage of the rich archival resources available (Bell 1990:66-67; Davidson 1999:2-3). In the past, archaeological studies of prehistoric cemeteries and cultural anthropology research into the mortuary practices of “other” societies tended to focus – even fixate – on interpretations of status (e.g., Binford 1971; Brown 1995; Carr 1995; Saxe 1970; Tainter 1978). Despite the limitations of the applicability to even prehistoric cemeteries of methods such as the assessment of vertical vs. horizontal differentiation in burial types or the use of cluster analysis to derive social organisational complexity from burial programs, the ideas persisted in publications about historical burial grounds (Braun 1981). Around 1990, however, a number of publications appeared which illustrate the lack of correspondence between mortuary treatment and socioeconomic status, particularly in nineteenth-century British and American graveyards (Bell 1990; Cannon 1989; Little *et al.* 1992). Researchers found that the ability to utilise historical records in addition to observations of material culture allows for at least the possibility of more accurate interpretation. In a study of funerary trends in Victorian-to-modern England and among the historic-period Iroquois of the northeastern United States, Cannon (1989) identified a cycle which begins with competitive elaborate mortuary display by high-status groups, followed by emulation by lower social strata and eventual abandonment of elaboration by upper classes in order to re-establish differentiation. Cannon (1989) also demonstrates how this cycle applies to the interpretation of changes in mortuary ostentation in ancient Greece from the Dark Age to the Classical period, based on archaeological findings alone. The cyclical nature of what Cannon terms "display effectiveness" (Cannon 1989:447) results in a garbled archaeological signature of status or social identity. Evidence of elaborate mortuary treatment could indicate an assertion of status, the masking of status, or a statement of status aspiration.

In the case of the excavation of the Uxbridge Almshouse Burial Ground (Bell 1990), historical records and sociocultural context allowed for better interpretation of the archaeological signature of decorative coffin hardware. Based solely on the material culture, excavators would have assumed that a cross-section of society was represented by the burials, including the poor, some middle-class, and three wealthy individuals. Archival documents, however, revealed that the burial ground was a pauper graveyard, where researchers would have expected to find only the simplest of coffins, the bare minimum required for "decent Christian burial" at the expense of local government. The complete picture was formed only through a multi-evidential approach. Despite limited funding, some almshouse coffins were fitted with elaborate-appearing, mass-produced hardware, in accordance with the fashion during the later decades of the cemetery's use (Bell 1990:72). According to Cannon (1989), this type of contradictory mortuary display (in which true status is the opposite of expressed status) occurs towards the end of the elaboration cycle, when individuals of high status have begun to show mortuary restraint. Bell (1990:67-72), however, emphasises that the mass-production and mass-marketing of coffin hardware made the products so universally available that they should not be considered analogous to grave goods in prehistoric contexts. The presence of decorative coffin hardware cannot be considered an unequivocal indication of socioeconomic rank, but rather an indication of consumer choice.

According to Saxe (1970:5), "Treatment of the dead reflects the rights of the deceased and duties of others in his various identity relationships," which is to say that mortuary treatment demonstrates not only an individual's overall status but also the obligations of other community members in relation to that status. While these ideas may (or may not) be applicable to pre-industrial cultures, they are not relevant to the studies of capitalist societies (LeeDecker 2009:149). In nineteenth-century America, all of the dead had the same right to a "decent" burial, whether funeral arrangements were made by family, friends, or, in the absence of those, municipal institutions (Richards 1997:277-278). Decisions that resulted in slight variations in mortuary treatment were made not by the community but by the principal mourners/consumers and might express true social identity, mask social identity, or create a desired social identity (Bell 1990:67-68; Davidson 2010).

Though mortuary analyses of historical American cemeteries have been the subject of numerous dissertations, theses, and conference presentations (e.g., Crow 2004; Davidson 1999, 2004; Kimsey 2010; Pye 2007; Richardson 1997), the majority of the excavations are conducted as compliance projects rather than academic ventures, with the primary objective simply the removal of the bothersome dead to make way for development (Davidson 1999:2). As such, the time and resources allotted for cemetery excavations vary widely, ranging from frantic salvage projects conducted just ahead of the bulldozers (see Daley 2017) to well-funded undertakings beginning with archival research and descendant consultation years in advance of digging (Heilen *et al.* 2010). Laboratory work is variably funded, with only in-field analysis performed in some cases (e.g., McKee 2012). The quantity of the data is vast, with the author of the current work having collected over 150 excavation reports and other publications concerning such projects in the United States and Canada. The level of detail provided in these reports, however, is as variable as the funding. Most of the cemeteries used for comparative material in the present study were selected because of the quality of data available and the size of the burial population.

2.2. American Mortuary Practices

2.2.1. THE AMERICAN WAY OF DEATH

For decades it has been noted that, despite the cultural heterogeneity of American society, there is a remarkable uniformity of death and funeral rituals, a basic structure underlying popular mortuary tradition with only superficial variations due to differences in religion, ethnicity, social class, and geographical region (Huntington and Metcalf 1979:187). Discussed at length by Mitford (1963, 1998) and Farrell (1980), this consistency of ritual is often seen as the product of “ruthless capitalism” (Huntington and Metcalf 1979:190), the commercialising of grief and corpse disposal, with the medical community and funeral industry removing the family (and, to some extent, religion) from the spheres of death and dying. Though the rise of the funeral industry may account for the uniformity, and certainly the profitability, of American funerals, Huntington and Metcalf (1979:194) argue that commercial control is not responsible for the format of these funerals.

The normatively sanctioned parts of American funeral ritual enumerated by Huntington and Metcalf (1979:198) include the embalming of the corpse (after its swift removal from the home or hospital to the funeral home), the display of the cosmetically-modified corpse during an extended wake which often blends seamlessly into a formal funeral in the same building, and coffined inhumation in a public cemetery. These standard rites had been stable for almost 100 years at the time of Huntington and Metcalf’s 1979 publication, as cremation was rare in the United States. Considerable diversification has occurred in recent decades, with cremation and “green burial” becoming more popular (Lillie and Mack 2015:188; Mitford 1998), but it is these older traditions which are of interest, and which Huntington and

Metcalf (1979:205) attribute to an “indigenous American religion.” This civil religion is theorised to exist alongside the standard sects of American organised religions, and its worldview is expressed in historic documents (e.g., the Declaration of Independence and the United States Constitution), in national sermons (presidential addresses), in celebrations peculiar to the United States (Halloween, Thanksgiving, American Christmas), and in fixed death rituals. Though its origins can be traced to earlier decades, the form of the American funeral truly solidified after the national experience of the Civil War and the assassination of Lincoln, which popularised the practice of embalming. The ideal death in modern America comes after a productive, fulfilling life, which is followed by a gentle decline in old age. Properly made-up, the displayed corpse embodies peace and fulfilment at the end of this life. The wake is the most important part of the funeral rites because it addresses the loss to the larger group, as well as providing an opportunity to discuss the accomplishments of the deceased (Farrell 1980: 5, 160-161, 181; Huntington and Metcalf 1979:205-211). Though rituals specific to a region or ethnic tradition – the Midwestern funeral lunch, the New Orleans Jazz funeral parade, the distribution of envelopes by Chinese-Americans – may be added, the essential elements remain the same and reflect the shared culture (Bordere 2008; Hallett 2017:51; Tien 2017).

Prior to the rise of the funeral and medical industries, from the Colonial period through the mid-nineteenth century, American funerals had a similar form but with different venues. Death often took place in the home, which is also where the body was prepared (washed, not embalmed) and displayed on a board or in a coffin for viewing by family, friends, and acquaintances. The coffined corpse was sometimes, but not always, taken to a church for a funeral service before the procession to the graveyard for interment (Coffin 1976; LeeDecker 2009:142; Mitford 1963:199; Wells 2003). This last step, the interment of the deceased in a coffin within an established burial ground, was considered the bare minimum for a “decent” burial (Hoffman 1919:6-9), and thus was afforded to even the lowest-status members of society, including poor house inmates, executed prisoners, and victims of epidemics (Mack 2013f:287-288; Richards 1997:iv, 9; Wells 2003:66). As in modern America, some cultural and regional variations existed (LeeDecker 2009:142). For instance, the Dutch in eighteenth-century New Amsterdam used an “inviter” to announce a death, while Moravians in Pennsylvania played trombones from a church tower, and the English rang church bells (Coffin 1976:69-72; Fischer 1989:701; Wells 2003:66). However, the elements which are observable in the archaeological record – coffined inhumation, supine and extended body position, burial orientation (usually facing east), limited grave goods – are consistent in all American graveyards and are reflections of the mortuary traditions of the majority European and Christian population. Not surprisingly, the funerary practices of early America were most similar to those of the British Isles, with the emphasis on the wake originating among settlers from Ireland, Scotland, and Northern England (Fischer 1989:111-116, 326-332, 517-522, 697-702; LeeDecker 2009:142).

Given the lack of variation in American mortuary deposits, it is clear why applications of anthropological methods of status evaluation (e.g., Saxe 1970) have been problematic. Most of the attributes tabulated in Saxe's work, such as disposal type, disposal location, burial container type, grave shape, body position, and body orientation, are invariable in early American cemeteries, being tightly controlled by nationwide social standards. Archaeologically observable variations are largely restricted to coffin design, burial clothing, and grave goods, as seen at the Third Street Cemetery (Lillie and Mack 2013). The first two categories of variation are strongly associated with temporal trends as well as family predilections (see Sections 2.2.3 and 2.2.4 below for discussion). The inclusion of grave goods, if any, appears to have been a matter of personal choice by the family, one not dictated by standardised protocol but made within the bounds of what was considered permissible by the religious or ethnic group to which the family belonged, with some objects clearly related to folk beliefs (Cannon 1989:437; Davidson 2010; Mainfort and Davidson 2006:199-201; Richards 1997:251-269; Heilen *et al.* 2010:309-317; Ball 2003). If American civil religion was the dominant ideology behind America's fixed death rituals, then the selection of the coffin, clothing, and grave goods may be considered a demonstration of the individual rights which constitute a cornerstone of that civil religion (Wilsey 2015:9).

2.2.2. EARLY NINETEENTH-CENTURY ATTITUDES TOWARDS DEATH AND FUNERALS

"Death was indeed that thing 'that all man feels'; and it behooved all men to give that fact sober consideration," states Lewis Saum in his essay, "Death in the Popular Mind of Pre-Civil War America" (Saum 1975:32). The nineteenth century was not only a period of high mortality, but one of high *awareness* of mortality, when death was such a routine thing that parents commonly specified the proportion of their living offspring to the total borne. Such was the resignation to the loss of children that infants frequently went unnamed for up to a year. Letter writers and diarists shared graphic, gruesome details of the progression from illness to death, though their impetus may have been the conveyance of medical knowledge rather than mere morbid obsession. Early nineteenth-century Americans were resigned to death as a manifestation of Providence and inured to loss as an everyday occurrence (Saum 1975:33-38). Yet they were not devoid of sentiment, as is demonstrated by the rise of the genre of consolation literature beginning around 1830 (Douglas 1975:49-68). Ariés describes the nineteenth century in Western societies as period in which the family regained the right to demonstrate "extreme grief," after the long era of ritualised mourning from the thirteenth through eighteenth centuries (Ariés 1975:146).

Death rituals, as portrayed in correspondence and diaries as well as literature, were focused more on the deathbed than the graveyard. This gathering of family and friends around the deceased (when the schedule of dying made such a meeting possible) was reciprocal in nature; the family comforted the dying, while the soon-to-be-deceased provided reassurance by remaining stoic and calm (Farrell 1980:22; Saum 1975:41). The fact of dying gave significance, even authority, to the person at the centre of the scene (Douglas 1975:59). Even after death, the focus was on the home, where preparation of the body and visitation took place, rather than the burial ground, where ceremonies were relatively brief (Wells 2003). In modern America, it is customary for the family to leave the cemetery before the grave is back-filled (Huntington and Metcalf 1979:203). This may have been the case in the nineteenth century as well. The discovery of pipe stems and the bones of disturbed skeletons in grave shafts at the Third Street Cemetery suggests burial scenes that would have been unseemly in the presence of the bereaved (Lillie and Mack 2013).

The ideal death was anticipated and planned for, and it was not uncommon to have some items laid aside in anticipation of one's own funeral (Farrell 1980:36-40; Coffin 1976:73-76). This practice was observed in late nineteenth-century Dubuque, as well; a newspaper article describing the funeral of a woman buried in the Third Street Cemetery states that "…her shroud and all the necessary grave clothes were found in her bureau, where she had carefully deposited them for the coming day – even the crape for the pall bearers and every minutia necessary for the occasion was carefully prepared by her own hand (*Dubuque Herald* 1878a)." The deceased, Catherine Quigley, was 80 years old, and thus had ample time to plan her funeral (Lillie and Mack 2013:797). Arrangements for unexpected deaths, including those of adolescents, likely involved more improvisation, with little time for carefully weighed decisions.

2.2.3. THE BEAUTIFICATION OF DEATH: MORTUARY DISPLAY IN SOCIO-HISTORICAL CONTEXT

During the Colonial period in America, most funerals were simple affairs, with the shrouded corpse placed in a plain wooden coffin and transported by foot or unadorned hearse to the community burial ground for a brief service (Pike and Armstrong 1980:15-16; LeeDecker 2009:142). These were community events, because the loss of any member impacted (in theory) everyone in the small settlements in which most colonists lived. In the nineteenth century, as the population of the United States grew, urban centres expanded, the Industrial Revolution took hold, and the gaps between the wealthy and poor widened, all of which weakened the communal structure of Colonial society. The new focus fell on a smaller, more discrete social unit, the family (Stannard 1980:19-23). This withdrawal from society meant that the burden of mourning now rested primarily on the immediate family, no longer shared by the larger community. Stannard (1980:26) associates this heavy personal burden with the rise of elaborate funerals and ritualised customs of remembrance, which helped the bereaved navigate these new social circumstances. Taylor (1980:40) additionally attributes changes in funerary ritual to the new focus on the body and soul of the deceased which was the product of the Romantic movement. The ideological, ritual, and material transformations in funerary behaviour described below are known collectively as the Beautification of Death.

Romanticism in the early and mid-nineteenth century embraced nature as a source of beauty and inspiration and placed value on the individual and on the emotions of man (Farrell 1980:30-34; Gabriel 1950:43). These philosophical priorities, which permeated the art and literature of the time, also led Americans to sentimentalise death and to create a domesticated image of Heaven (Farrell1980:34). The dying were no longer supposed to fear judgement, as their Puritan forebears had, but look joyfully forward to a promised reunion with loved ones in the afterlife. Mourning, then, was an expression of sorrow not for the deceased, but rather for the bereaved who were left behind (Pike and Armstrong 1980:16-17). Therefore, the austerity of black crape and the proscriptions against bright jewellery and adornment were only for the survivors (Coffin 1976: 197-201; Hillerman 1980:91-101). The dead could be dressed in their Sunday best, encased in ornamented caskets, and planted in carefully landscaped, garden-like cemeteries under decorative stone markers (Taylor 1980:46). The symbolism of the garden – representing God's creation – was found everywhere in the new funerary rites. Cut flowers surrounded the casket, and floral designs abounded on coffin hardware. Trees, plants, and flowers frequently appeared on grave markers, maintaining the perpetual appearance of a fertile garden in cemeteries even in winter (Ames 1981; Bell 1990:57; Burns 1990; Keister 2004; Mack 2013c:77; Ruby 1995:136-141; Springate 2015:66-67; Taylor 1980:43-46). Gone were the death's heads, skeletons, scythes, and hourglasses seen on the tombstones of the old urban graveyards and rural churchyards. The Beautification of Death movement replaced these symbols with natural motifs and scenes of "melancholy beauty" (Bell 1990:57). Also incorporated were themes from the American neoclassical movement, which sought to associate the United States with the Greek and Roman origins of democratic politics; this influence can be seen not only in architecture and furniture of the nineteenth century, but also in the columns, urns, and draped figures of funerary art (Green 1980:34; Bell 1990:57). Permanent stone monuments became affordable to a larger segment of society as the industry grew, allowing social identities to persist long after death (Mytum 1989, 2007).

These sentimental and uplifting grave markers were set against the backdrop of the new rural cemetery, a quiet place of “natural” beauty (well-planned and landscaped, of course), a haven away from the bustle of everyday life, designed to promote retrospection and reverence (Douglas 1975:62; Stannard 1980:26). “Romantic ideas about death and landscape shaped antebellum America’s solution to the practical problem of urban burial” (Connors 2003:187); interment of the dead was not merely a philosophical issue. Crowded, poorly managed, unsightly graveyards within cities occupied valuable land and were also suspected of being health hazards (Farrell 1980:99-112; Mytum 1989). Beginning in Massachusetts in 1830, the rural cemetery movement freed up property for development and urban expansion, as some churches chose to remove all the graves from old churchyards to the new burial grounds outside of towns. Picturesque settings were designed to encourage mourners to visit the dead, and names like “Mount Auburn,” “Mount Olivet,” and “Greenwood” were chosen to conjure peaceful visions of nature (Simon 1980:53-55). Even the word “cemetery” (from the Greek for “sleeping place”) suggests a place of rest rather than death (Farrell 1980:107-111). Before long, these rural cemeteries were leisure destinations as well as gardens of comfort for the bereaved (Simon 1980:59).

The Romantic emphasis on nature and heavenly reunion with God and family sometimes seems at odds with the strict mourning protocols that developed during this same period in America. Indeed, there was a movement against such paradoxical expressions. In the 1850s, one of the most vocal opponents, Congregationalist minister Henry Ward Beecher, advocated expressions of hope and joy for the deceased, now safe in immortality, rather than mourning, and he advised families to sprinkle the ground with flowers rather than tears. However, Beecher’s denial of death as merely a portal to Heaven would not catch on in the United States until the rejection of the Beautification of Death in the twentieth century (Farrell 1980:79-98). In the meantime, meeting the demands of mourning rituals – particularly in regards to attire – served as an outlet for the bereaved, a diversion from the reality of death and a task to focus on at a time of confusion. Alteration of appearance helped the mourner to accept the greater changes that accompanied the loss (Hillerman 1980:92). Of course, it must be remembered that the Beautification of Death was a movement spurred by commercial as well as philosophical developments, with mass-production, mass-marketing, and improved freight transportation allowing for the greater dissemination of fashions (Bell 1990). In addition to the rising costs of caskets, burial plots, funerary monuments, and undertakers to make the arrangements, substantial outlays of money were required for funeral crape and wreaths, mourning stationary, bombazine mourning dresses in black (or grey and purple after the first year), crape veils and bonnets, black gloves and fans, black-bordered handkerchiefs, and jet or onyx jewellery. Memorial lockets, miniature memorial portraits, and memorial hair jewellery could be commissioned. An endless variety of products was available for consumers, illustrated in etiquette books, ladies' magazines, and catalogues (Coffin 1976:195-202; Farrell 1980:34; Hillerman 1980:91-106). Despite heavy advertisement and the emphasis on mourning in the literature of the time, these practices were certainly not adopted by all members of American society; rather, they were restricted to the upper class, who could afford such luxuries, and the middle-class, who could afford to emulate them (Hillerman 1980:92, 105). These mourning rituals are rarely represented in the archaeological record and are mentioned here only as an example of the intersection of ideological, technological, and economic developments that brought about the material culture of the Beautification of Death. These developments are discussed in greater detail in the sections below which focus on the material culture commonly observed archaeologically.

2.2.4. MATERIAL CULTURE OF NINETEENTH-CENTURY BURIALS

Coffins and Coffin Hardware

Coffin types and coffin hardware have received more attention than any other aspect of material culture excavated from American cemeteries, likely due to the hardy preservation and ubiquity of metal fasteners and fixtures. In addition to the previously discussed publications which disproved the explicit association of coffin hardware with status (Bell 1990; Cannon 1989; Little *et al.* 1992), subsequent studies have used coffin types and coffin trimmings to establish cemetery chronologies and to calculate funeral expenditures based on coffin catalogue price lists (Crow 2004; Davidson 1999; Mainfort and Davidson 2006; Pye 2007). Researchers have amassed extensive libraries of coffin hardware catalogues dating to the nineteenth and early twentieth centuries (e.g., Mainfort and Davidson 2006), and one project focused on an extant late-nineteenth- to early-twentieth-century coffin hardware collection found in the 1980s in the stockroom of a family-owned general store in South Carolina (Hacker-Norton and Trinkely 1984). Current work includes a metallurgical study of coffin hardware in England and the United States (Neal 2018).

Coffins

Coffin wood is rarely well-preserved in archaeological contexts, so coffin type is generally defined by coffin outline shape alone. Though many small variations existed, coffin outlines can be divided into two basic groups, fitted (Figure 2.1a) and rectangular (Figure 2.1b). The popularity of these two coffin types shifted in the 1800s, with non-fitted "caskets" dominating the market by the end of the century. As use of both designs overlapped temporally and continued into the twentieth century, coffin shape is of limited use for determining chronology (Mainfort and Davidson 2006:109-110). However, when preservation is sufficient for identification, the technique used to produce a fitted coffin can indicate the source of manufacture. In true hexagonal coffins, each of the two side walls is constructed of two boards with a mitred corner at the shoulder. The other type of shouldered coffin (Figure 2.1a) is created by kerfing or steam-bending a single board, which gives the shouldered wall a curved rather than angular appearance (Mainfort and Davidson 2006:104-105). A bent-shouldered coffin is likely to have been factory produced or made by a skilled carpenter, while mitred corners may suggest non-specialist or even home production (Mainfort and Davidson 2006:106). The increasingly popular straight-sided burial containers avoided what was now considered the grotesque imitation of body shape altogether. The term "casket" was intended to evoke a sense of preciousness about the cargo, serving as a decorative container for presentation rather than merely a corpse holder (Farrell 1980:170-172; Taylor 1980:46). Costly metallic coffins also evolved from the sarcophagus style of the 1848 Fisk cast iron coffin patent to the sheet-metal rectangular caskets produce by Crane, Breed & Company. Advertisements for these metallic containers promised an air-tight seal and perfect preservation of the corpse within, a notion that held increasing appeal as the century progressed (Allen 2002; Tharp 1996:177-218).

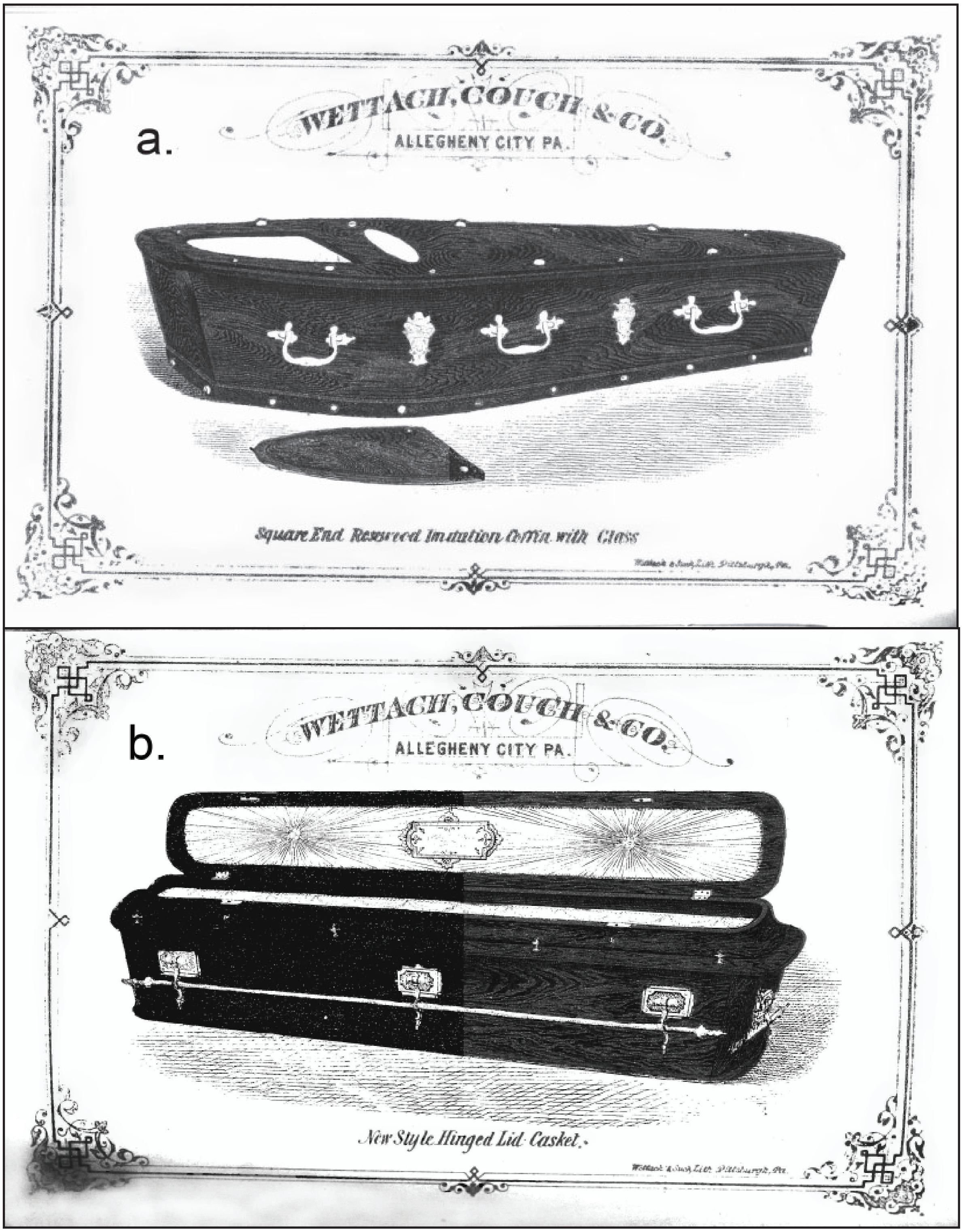

Figure 2.1. Two types of burial containers used in the nineteenth century: a) bent-shouldered coffin, and b) rectangular casket. Images taken from the Wettach, Couch & Co. illustrated catalogue (Wettach, Couch, & Co. 1875).

Decorative Coffin Hardware

Decorative coffin hardware existed in America prior to the 1850s, but its use was infrequent, and the pieces were individually made and often imported. Most coffins were constructed simply with nails and occasionally plain utilitarian screws for fastening the lid. Even the use of plain screws did not become common until 1846 when the patent was granted for a machine-made gimlet screw (Mainfort and Davidson 2006:144-145; Springate 2015:51-56). Improvements in metal-working machinery and increased mass-production capabilities are credited, along with the introduction of cheap, malleable alloys, with making decorative coffin hardware both more available and more affordable. Illustrated trade catalogues, which proliferated in the mid-nineteenth century, brought urban funerary tastes to areas far removed from production centres (Bell 1990:57). Improvements in the postal service and transportation networks allowed both the catalogues and products to be distributed widely, while the telegraph system provided the option of quick ordering (Springate 2015:58-59). Availability is inconsequential, however, if consumers are not interested in the product. Decorative coffin hardware was popular in the late nineteenth century because it provided "memorialization and display of the dead in a beautified manner" *and* because it was readily available (Bell 1990:58). At just $2.50 for a dozen pairs of silver-plated coffin handles in 1875 (C. Sidney Norris & Co. 1875), or roughly $2.40 per piece in 2020 dollars, coffin hardware provided one of the least expensive expressions of the Beautification of Death.

Coffin hardware typologies commonly separate these objects into the categories of functional and purely decorative fittings (Springate 2015:15-29). Functional hardware includes coffin handles, coffin screws, thumbscrews, hinges, and caplifters. Decorative items include escutcheons, screw caps, ornamental tacks (or studs), dummy screws, and coffin lid plates. The terminology for various hardware items differs from publication to publication, but the present study will follow that utilised by Cindy Nagel in the original Third Street Cemetery report (Lillie *et al.* 2013:167-215).

Coffin handles have been documented in American cemeteries dating back to the 1700s, but mass-produced handles made specifically for funerary usage first appeared in hardware catalogues around 1853 (Springate 2015:16-17). Nineteenth-century handles followed two basic designs, both of which continued to be used into the twentieth century. A swingbail handle (Figure 2.2) has a circular or U-shaped grip attached to a lug or lugs fixed to the coffin wall. The short bar handle (Figure 2.3), which was first patented in the United States in 1866, has a cylindrical or similarly shaped grip fixed to two swinging brackets (Lillie *et al.* 2013:179-182; Mainfort and Davidson 2006:122-128; Springate 2015:16-19). Coffin handles were made from brass, iron, and Britannia metal (90% tin, 10% antimony), but white metal, a mix of tin, antimony, arsenic, and sometimes lead, was the most popular material for coffin hardware in the nineteenth century (Springate 2015:13).

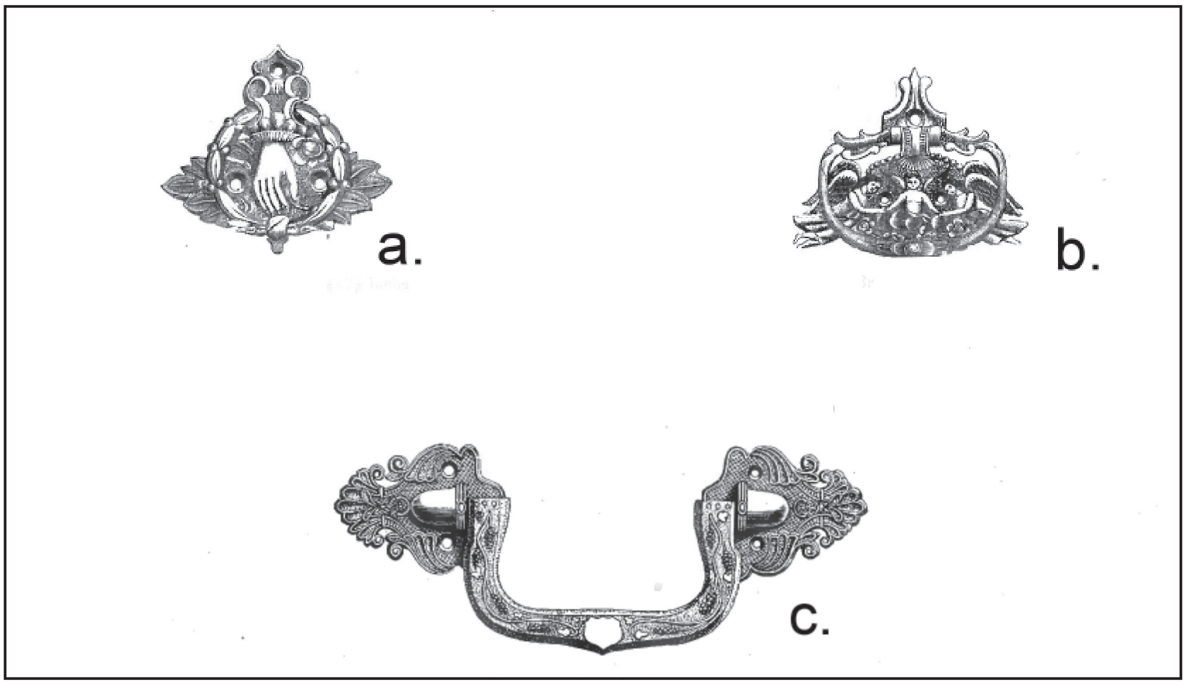

Figure 2.2. Examples of three types of swingbail handles: a) drop ring, b) single-lug swingbail, and c) double-lug swingbail. Images from the illustrated catalogue of Wayne Hardware Co. (1874:6, 11).

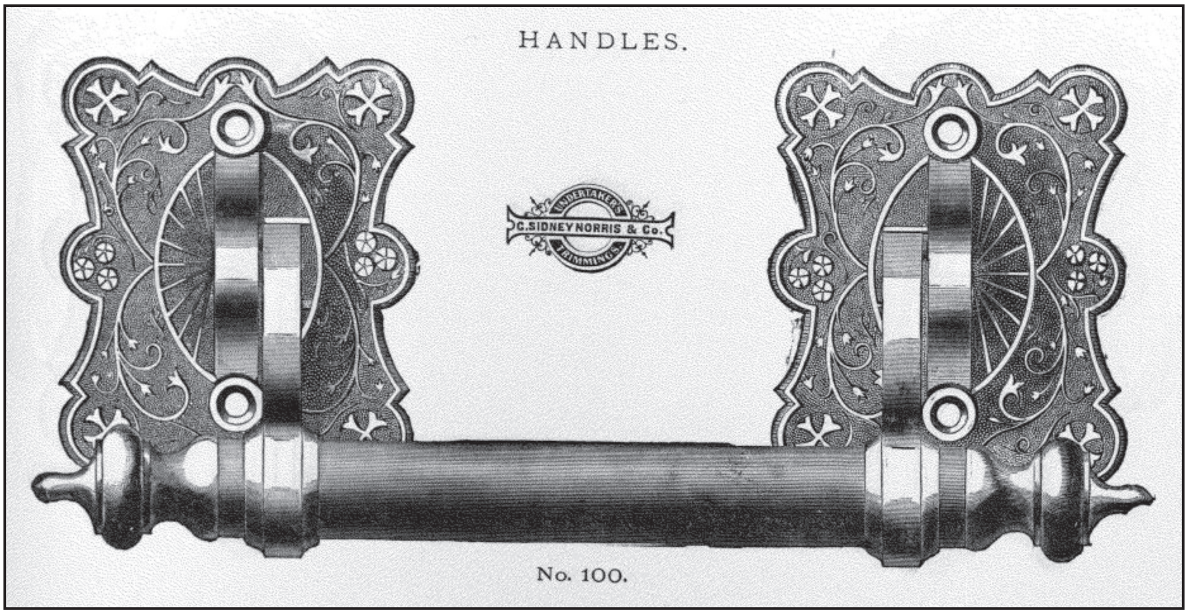

Figure 2.3. Example of a short bar handle. Image from the catalogue of C. Sidney Norris & Co. (ca. 1875:61).

Besides nails or utilitarian screws, which were used on plain coffins, two types of fasteners were used to affix coffin lids in the nineteenth century. Coffin screws (Figure 2.4a), which are slotted white metal caps soldered to or cast around tapered iron screws, were first commonly available for purchase in the 1850s and continued to be used through the early twentieth century. Thumbscrews replaced coffin screws as the fashionable type of closure, as they were more decorative and could be installed gently by hand, without the use of a screwdriver. Manufactured in cylindrical, urn-shaped, or flat-bodied forms (Figure 2.4 b,c,d), these thumbscrew types were first marketed around 1869, 1871, and 1874, respectively (Mainfort and Davidson 2006:131-141).

Decorative coffin hinges, which allowed viewing of the bust of the corpse, were advertised in catalogues as early as the 1850s but fell out of vogue by the 1870s and 1880s, probably due to the rising popularity of viewing panes (Pye 2007:153-154; Springate 2015:23-24). Though patents for coffin designs incorporating glass panes date back to 1843, inclusion of this element was not common until the 1870s, when most high-end manufactured burial containers advertised in catalogues included windows (Mainfort and Davidson 2006:155-156). Thus, while viewing panes by themselves do not necessarily indicate that a large sum was expended on a coffin

(Elia and Wesolowski 1991:281; Raemsch and Bouchard 2000:120), glass windows are usually found on factory-made coffins in conjunction with decorative hardware. Viewing panes had wooden (or, in metallic caskets, metal) covers to protect the glass during the infilling of the grave. Caplifters, similar in design to thumbscrews but with a shorter shank, were used to lift off or fasten the cover over the viewing pane (Mainfort and Davidson 2006:163-164). At the Third Street Cemetery, rosebud (Figure 2.5) and seashell-shaped caplifters were recovered (Lillie *et al.* 2013:211).

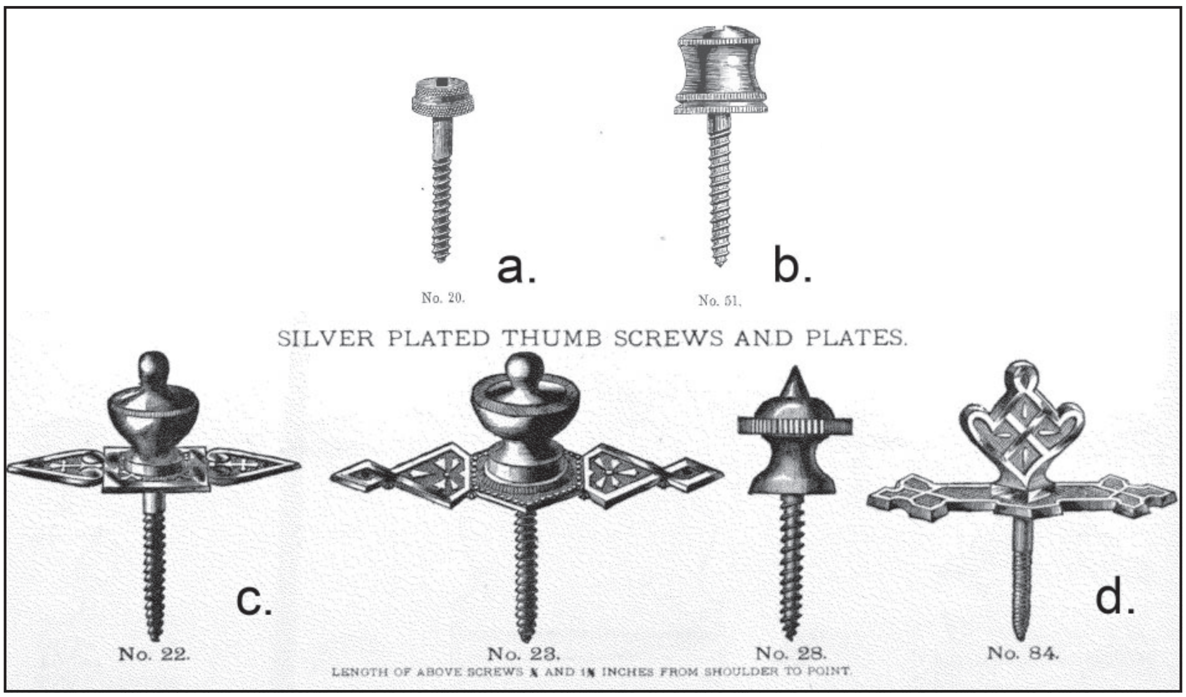

Figure 2.4. Four types of nineteenth-century coffin lid fasteners: a) coffin screw and b) cylindrical thumbscrew (illustrations from the catalogue of Wayne Hardware Co., 1874:43), c) urn-shaped thumbscrew and d) flat-bodied thumbscrew (illustration from the catalogue of C. Sidney Norris & Co., ca. 1875:10).

Figure 2.5. Rose caplifters recovered from Burial 868, Third Street Cemetery, Dubuque, Iowa. Photograph used with the permission of the University of Iowa Office of the State Archaeologist.

Purely decorative coffin hardware elements were sometimes made from the same white metal as the functional elements, though they were more often stamped from thin tin or brass (Springate 2015:26). Escutcheons are flat decorative elements affixed to the coffin lid which served as baseplates through which coffin screws, thumbscrews, or caplifters were threaded (Figure 2.4 c and d). Though they were advertised as early as 1865, escutcheons became more popular with the introduction of the thumbscrew, and they were often sold with thumbscrews as matched sets. Escutcheons are distinct from screw caps, which were placed over utilitarian screws to conceal them (Figure 2.6). Ornamental tacks are small decorative elements attached to the coffin exterior by means of a thin, short shank. These include simple domed brass tacks similar to upholstery tacks, which were used to create designs and initials, as well as pressed sheet metal tack heads with floral, geometric and religious motifs (Figure 2.7). Dummy screws also fall into the category of ornamental tacks, as they serve no structural purpose; they were designed with the same slotted white metal heads as the coffin screws they complimented but were affixed to small tacks and used to fill empty space on the coffin lid (Lillie *et al.* 2013:202-211; Mainfort and Davidson 2006:146-155; Springate 2015:26-27).

Springate (2015:27-28) places coffin lid plates in the separate category of "identification" rather than decorative. Though in the very late nineteenth century and twentieth century, these plates were manufactured with standard inscriptions, such as "At Rest" or "Our Darling," earlier plates were engraved with information such as the name of the deceased, age at death, and date of death. Plates were produced in a variety of shapes and designs, but nearly all of those found at the Third Street Cemetery were cross-shaped (Figure 2.8). A number of coffin lid crosses and crucifixes without inscriptions were also recovered (Lillie *et al.* 2013:176-178; Mainfort and Davidson 2006:151; Springate 2015:27-28).

Material culture manifestations of the Beautification of Death reached a peak in the 1860s and 1870s, with new coffin hardware types (short bar handles and flat-bodied thumbscrews) becoming popular in the last decade before the Third Street Cemetery fell out of use in 1880. The downturn of elaborate mortuary display occurred at the end of the century, after the cemetery at the centre of this study was abandoned (Mack 2013a:38; Little *et al.* 1992:412-415). Therefore, issues of elite restraint of display and hinterland "stylistic lag" are not of concern (Cannon 1989: Hacker-Norton and Trinkley 1984); it can be assumed from both nationwide fashions and a review of Dubuque city directories that elaboration of coffin decoration was trending upward during the active period of the Third Street Cemetery (Mack 2013c:75-78).

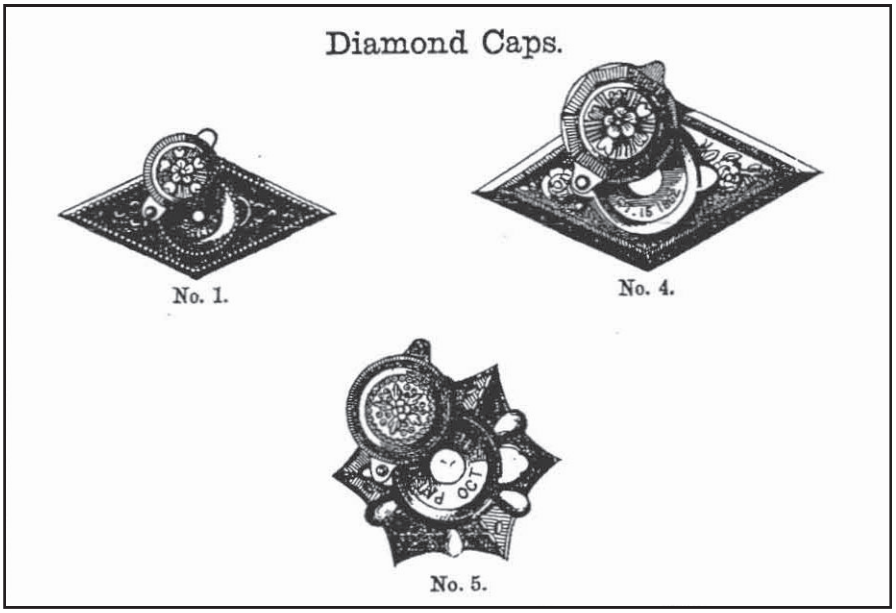

Figure 2.6. Screwcaps illustrated in the hardware catalogue of Russell and Erwin Manufacturing Company (1865:331).

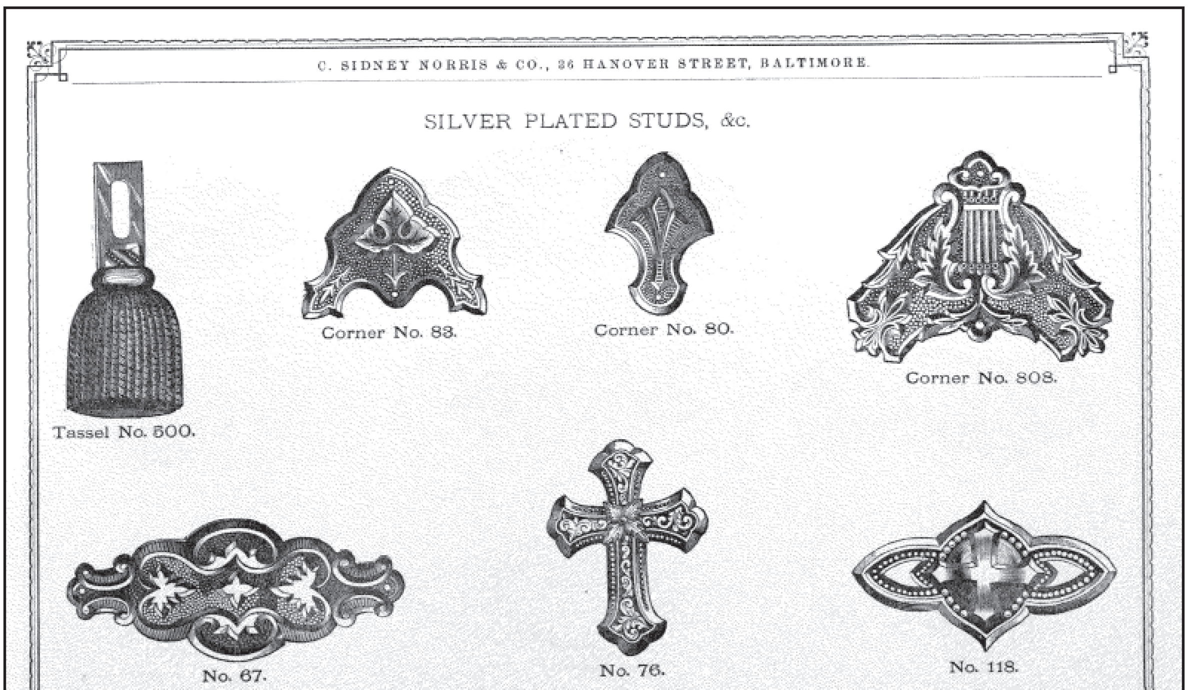

Figure 2.7. Examples of ornamental coffin tacks from the illustrated catalogue of C. Sidney Norris & Co. (ca. 1875:7).

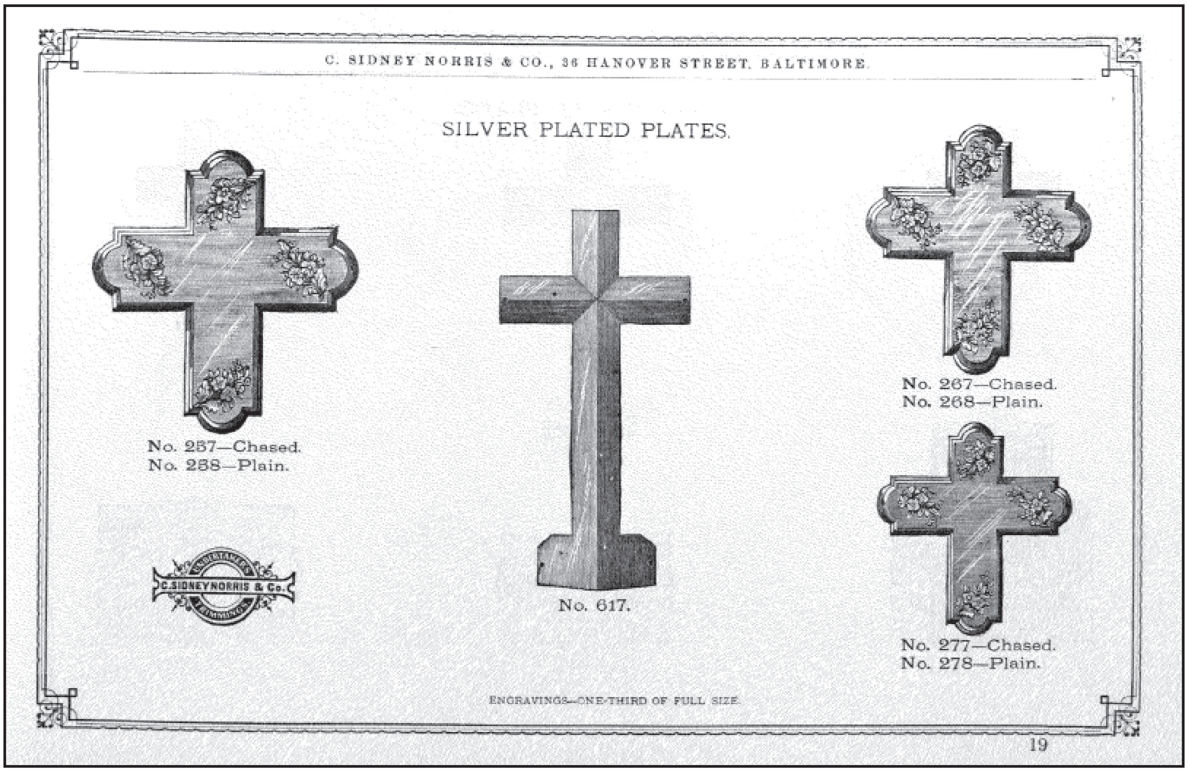

Figure 2.8. Cross-shaped coffin lid plates from the illustrated catalogue of C. Sidney Norris & Co. (ca. 1875:19).

Burial Clothing

A major change in funerary customs attributed to the Beautification of Death is the transition from burial in a shroud to burial in one's "Sunday best" clothing (e.g., Hogue and Alvey 2006:51; LeeDecker 2009:154; Taylor 1980:46). However, many authors who mention this shift fail to take into account the accompanying changes in the definition of "shroud" and specific factors, such as age and sex of the deceased, which affected decisions concerning burial attire. While burial in "day wear" (clothing that could be worn in public by the living) was more common after the 1850, it was certainly not the rule.

Coffin describes the shrouds used by Colonial Americans for burial as rectangular constructions with drawstrings at the top, sewn from white linen, cerecloth (linen dipped in wax), wool soaked in alum or pitch, or occasionally cashmere (Coffin 1976:73, 101). Shrouds could also be designed as a long dress or shirt, bound with pins or knotted at the feet (LeeDecker 2009:142). Mid- to late-nineteenth-century post-mortem photography and excavated burials with textile preservation indicate that this second type of shroud, a garment similar to a nightgown or nightshirt, was often used for burial during the Beautification of Death period (Aldridge 2008). In a paper concerning burial clothing from the Third Street Cemetery, Kimsey (2010:70) asserts that individuals buried in gowns or shrouds were unlikely to be displayed at wakes or open-casket funerals. The appearance of men, women, and children dressed in such attire and posed in beds and coffins for post-mortem photography disproves this hypothesis (Aldridge 2008). However, Aldridge (2008:73-74, 90) points out that gowns used for burial were not necessarily nightclothes worn in life, or even the same style as such nightclothes. The use of pinking instead of hemming indicates that some photographed gowns were produced specifically for burial purposes. The inclusion of day wear elements such as stiff collars and neck cloths on men's gowns indicates the purchase of burial outfits specifically marketed by the rising funeral industry. As late as the 1890s, these outfits were still referred to within the industry as shrouds, though they appeared in catalogues as "robes" or "wrappers" (Farrell 1980:165; Lillie 2013c:221). Figure 2.9 shows the types of burial garments for sale in the 1870s (Wayne Hardware Co. 1874).

Many of the increasingly elaborate shroud designs, which were offered in white, black, or brown, still resembled gowns and had few buttons or no buttons at all, though a new type of hybrid shroud or wrapper had also come into use. These new smock-style wrappers gave the appearance of day wear, with false buttons on the shirt and jacket elements, but were sewn as one piece and opened at the back for ease in dressing the corpse (Davidson 2016:238). Interestingly, there is one documented case of "Sunday best" clothing being covered with a gown-like shroud and a winding sheet in a nineteenth century burial (Brantley 1998). The continued popularity of burial gowns among some mourners may have been related to the Victorian conceptualisation of death as a type of sleep (Aldridge 2008:18).

Since customs permitted both day wear and shrouds/gowns for burial, the choice of attire was likely influenced by additional factors, such as age and sex. Kimsey (2010) hypothesised that children would be less likely to be buried in day wear, being of lower status, and that those buried in day wear would be found with few buttons, as children's clothing in the nineteenth century had fewer fasteners than adult clothes. However, Aldridge (2008:79-93) found that children in post-mortem photographs were more often buried in day wear than shrouds, though infants and toddlers were always buried in gowns, as such garments constituted their day wear as well as their sleeping garments. One should bear in mind that the preferences of the socioeconomic class which could afford post-mortem photography may not accurately reflect the opinions of the majority of Americans.

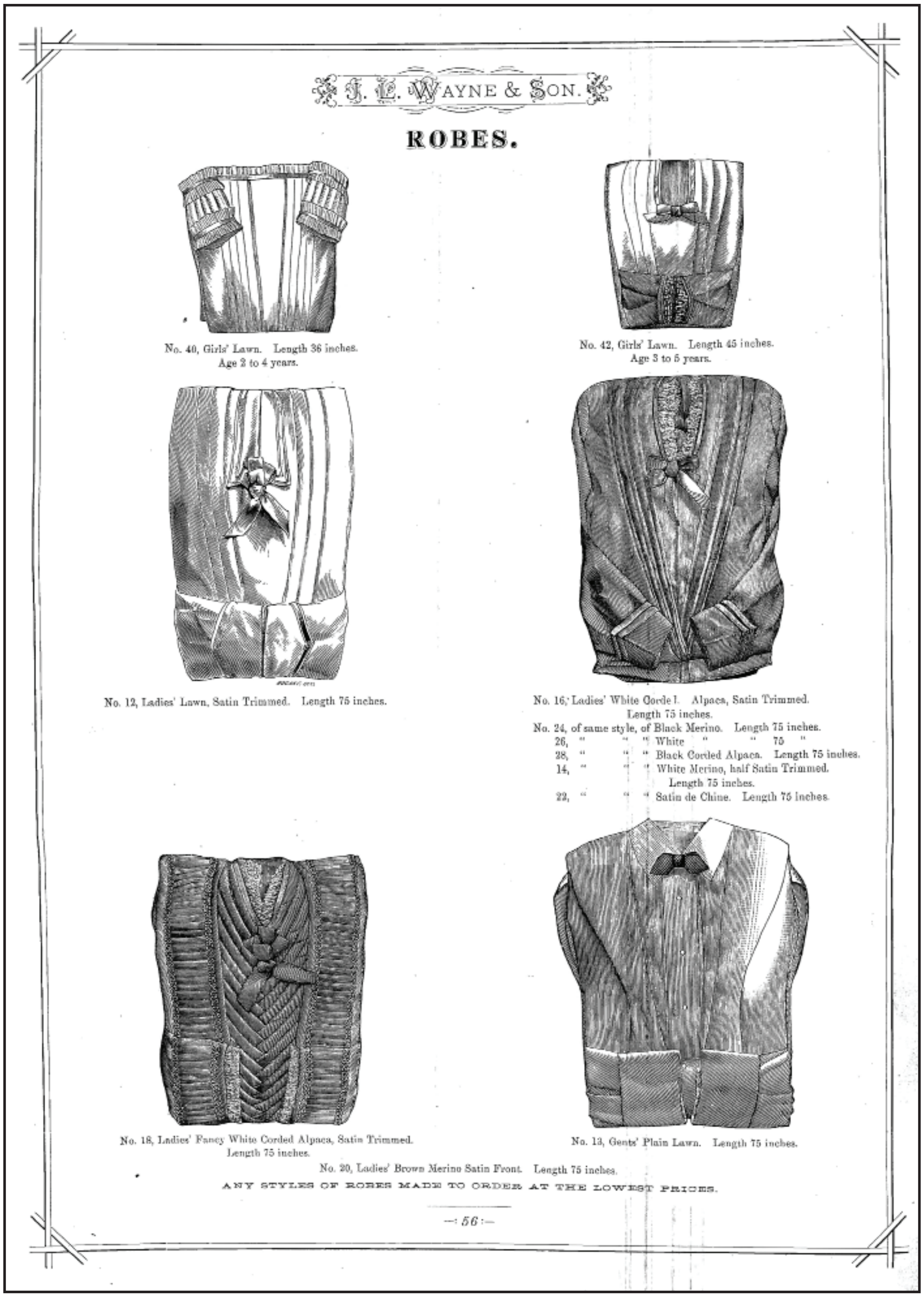

Figure 2.9. Burial robes advertised in the back of the catalogue for Wayne Hardware Co. (1874:56).

The sex of the deceased also affected decisions regarding burial outfits. According to one nineteenth-century etiquette article, “In dressing the remains for the grave, those of a man are usually ‘clad in his habit as he lived.’ For a woman, tastes differ; a white robe and cap, not necessarily shroud-like, are decidedly unexceptional” (*Harper’s Bazaar* 1886). The phrase “tastes differ” is an important one. Clearly personal preference was taken into account, whether it was the preference of the deceased, having planned ahead of time, or the preference of the principal mourners. Third Street’s Catherine Quigley, mentioned above, had laid aside a shroud *and* grave clothes for her own burial (*Dubuque Herald* 1878a). Two wealthy women from Louisiana who both died in the 1850s were buried in contrasting outfits. Leontine Lacapere was interred in a fashionable black silk taffeta gown with her gold jewellery. The gown’s hasty construction and the fact that remnant material was stuffed in her undergarments suggest that the gown was sewn while Leontine was dying or shortly after death, and that she either chose or agreed to the choice of her burial attire (Welker 1999). Leontine’s sister Clemence Evans, who died just a few years later, was buried in a simple white cotton nightgown with a hair comb and religious scapular as her only accessories (Hintlian 2001).

The two sisters’ burial outfits were perfectly preserved for future study by the conditions in their cast iron coffins. Most archaeologists are not fortunate enough to find good textile preservation in American cemeteries, and must make inferences from the number, type, material, and configuration of various clothing fasteners, including buttons, buckles, snaps, clasps, and grommets. Unfortunately, such analyses cannot speak to the appearance of clothing which might have been embellished with perishable details such as pleats, ruching, and flounces, or constructed from luxury fabrics like silk damask, brocade, or velvet. However, reasonable reconstructions of some garment styles can be undertaken when the locations of all clothing fasteners are carefully recorded during excavation (e.g., Mainfort and Davidson 2006:190-198; Sewell and Stanton 2008:154-161).

Personal Objects

Though most American cemetery excavation reports dedicate a few pages to “miscellaneous artefacts,” “grave inclusions,” or “personal accessories,” the placement of personal items in graves has rarely been the focus of archaeological research projects. The lack of academic interest can be explained by extremely small sample sizes. One of the few publications addressing the subject is Davidson’s (2010) investigation into the placing of a single shoe on the coffin lid, a tradition observed in only nine graves in three cemeteries. This shoe study is an exploration of the mixing of African cosmology and British folk beliefs, rather than an examination of individual mourners’ intentions. As Davidson states, “determining motivations decades or hundreds of years removed from the funeral event can be problematic” (Davidson 2010:615). Thus, his research has focused on patterns of deposition that correspond to African-American folk beliefs (the single shoe, pierced coins, black and white beads), rather than anomalous inclusions (Davidson 2004b, 2010, 2018). Two kinds of grave goods commonly attributed to folk beliefs shared by African- and Euro-American communities are household items and coins. Household items such as cups, saucers, and spoons are reported to be the last objects touched by the deceased, which are buried to prevent the contagion of death or the return of the deceased. Coins were reportedly placed on the eyes or elsewhere in the coffin to hold the eyelids shut (preventing the dangerous gaze of the deceased) and/or to pay a fee for transportation or entry into the afterlife (Coffin 1976:97; Davidson 2004:310-317; Mainfort and Davidson 2006:200, 217-218; Puckle 1926:50-52).

In her research concerning grave goods interred with individuals in paupers’ graves provided by municipal authorities in Milwaukee County (Wisconsin), Richards (1997) determined that utilitarian personal items – smoking pipes, pocket knives, fish hooks, spoons, bottles, and coins – were usually incidental inclusions; burial with such items indicated the deceased, likely unidentified, was sent to the cemetery from the coroner’s office and interred with whatever personal items were on the body at the time of death. Burial with religious items, such as rosaries and crucifixes, indicated that the deceased was prepared for burial by family members who could not afford interment and relied on Milwaukee County to provide a grave plot. Residents of the

Milwaukee County institutions (poor farm, insane asylum, orphanage) were buried in the same cemetery without any personal items.

When examining cemeteries where all, or nearly all, of the dead are presumed to have been interred by family or friends, reasons for the inclusion of grave goods are less clear. Religious objects are not required for Christian burial but are often placed in Catholic graves, and are discussed in greater detail below. Nonreligious items may represent accidental inclusion (e.g., items concealed in garment pockets) or intentional placement by mourners related to folk beliefs or sentimentality (Davidson 2004:310, 2010:615; Richards 1997:205-269).

2.3. Catholic Burial Practices in Europe and America

Printed in New York in 15 volumes between 1907 and 1912, *The Catholic Encyclopedia* was intended to be a comprehensive collection of Catholic beliefs and history to date. An extensive entry under “Burial, Christian” lays out all of the applicable church laws, traditions, and history, primarily citing sources from the eighteenth century to the turn of the twentieth century (Thurston 1908). Catholic teachings of the time emphasised the eventual resurrection of the body, with the belief in this dogma the motivation for careful interment of the corpse and eschewal of cremation. A Catholic had the right to be buried in consecrated ground in his or her own parish, and the parish priest could not deny burial based on failure to pay a fee in advance. Moreover, the very poor were to be buried at the expense of the parish. Those who could not be buried in consecrated ground included Catholics who fell out of communion with the church or were excommunicated, those who died in duels, suicides, unrepentant sinners, and, of course, pagans, Jews, infidels, and heretics (Thurston 1908). As late as 1961, the Catholic Church still forbade the interment of unbaptised babies in consecrated ground, though their corpses were to be buried “in a decent place” (Fenner 1961). However, conditional baptism, a sort of emergency baptism that could even be applied to an unborn child in the womb, could prevent stillborn and short-lived babies from being banished from Catholic cemeteries (Fanning 1907).

In addition to prayers said in the hours leading up to a death, the Catholic Church had three sets of rituals, including those at the home, at the church, and in the graveyard. At the home, the dead were to be "decently laid out," with a cross placed in the hands or the hands arranged in the form of a cross. A light was kept burning and the body was occasionally sprinkled with holy water. After enough time elapsed to be certain of death, the church bells tolled, and the parish priest went to the home, afterwards leading a procession, usually with lighted candles and a cross-bearer, to the church. A Requiem Mass or a low Mass of Requiem (one without music) was performed, followed by the sprinkling of holy water over the coffin and the passing over of incense. After a prayer of absolution was said over the dead, the funeral procession made its way to the cemetery, where the grave was oriented so that the decedent's head was to the west and feet to the east. The graveside service included a few brief prayers, then the coffin was lowered into the grave and sprinkled with holy water again. Following a final petition, the parish priest sometimes sprinkled a handful of earth on the coffin before returning to the church. Funerals for infants and small children followed a similar form, except that the priest wore a white stole instead of black, the church bells were not tolled, and a crown of flowers or foliage was placed on the child's head (Thurston 1908).

Little of this program would be evident in the archaeological recovery of burials, except for the orientation of the graves and the presence of a cross/crucifix or crossed hands, in the case of an adult, and remnants of flower wreaths with infants and children. According to *The Catholic Encyclopedia* article on burial, there was no official prescription for the inclusion of devotional medals, rosaries, chaplets, or scapulars in coffins, though the practice is well-known from archaeological excavations and continues to this day, as witnessed by the author (Heilen *et al.* 2010; Hintlian 2001; Lillie and Mack 2013). Also conspicuously absent from the article is the proscription against the inclusion of worldly goods in the coffin. This practice is mentioned only in the encyclopaedia article on cemeteries, and only in an offhand way. While describing the history of medieval cemeteries, the author remarks that Frank and Saxon Christians continued to inter men with their arms and women with their ornaments and occupational implements, a practice which encouraged the looting of graves. This tradition was reportedly ended by a decree passed in the time of Charlemagne (Curran 1908). While the Catholic Church does not expressly forbid the inclusion of secular items in burials, the practice has been actively discouraged both historically and in contemporary America (Fr. Matthew Worthen, personal communication 2011).

The Catholic Church perhaps permits religious grave goods as objects which will eventually be useful to the resurrected body. The mourners who place them in the coffins, however, have other motives, intending that the items serve as displays of piety or amulets of protection (Miller 2001:172-173). Among the commonly found religious objects are devotional medals, flat metal pendants which are struck or cast to commemorate the Virgin Mary, Jesus Christ, various saints, famous shrines, miracles, apparitions, pilgrimages, religious associations, or historical events (Figure 2.10). These images are intended to remind the wearer to honour the subject displayed on the medal (Ball 2003:346-350). Prayer-counting beads, in the form of the common Dominican five-decade rosary (Figure 2.11), four- or six-decade rosaries, or other bead arrangements known simply as chaplets, are also common. Based on archaeological findings, women are more likely to be buried with rosaries than men, probably because rosary society membership has historically been predominantly female (Ball 2003:94, 120-125, 485-488; Heilen *et al.* 2010:310; Mack 2013e:233; Miller 2001:20). A lay scapular, which is a modification of a larger garment worn by monks, is a set of two small woollen rectangles connected by a loop of string, worn so that one panel rests on the chest and the other on the back. The scapular is blessed by a priest and worn daily (usually under one's outer clothes) as a sign of devotion (Ball 2003:511-520). Being made of perishable materials, scapulars are rarely recovered from archaeological contexts. Crosses and crucifixes (crosses with the figure of Jesus attached, see Figure 2.12) are frequently found in burials both as grave goods and in the designs of coffin hardware. Finally, remnants of floral crowns placed in children's coffins are identified through the presence of twisted wire, metal circlets, and sometimes beads in the region of the cranium (Lillie *et al.* 176-178; Mack 2013e:244-251).

Figure 2.10. "Guardian Angel" medal recovered from Burial 868, Third Street Cemetery, Dubuque, Iowa. Photograph used with permission of the University of Iowa Office of the State Archaeologist.

Figure 2.11. Wood-bead rosary recovered from Burial 715B, Third Street Cemetery, Dubuque, Iowa. Photograph used with permission of the University of Iowa Office of the State Archaeologist.

Figure 2.12. Ebony and copper crucifix found in Burial 96, Third Street Cemetery, Dubuque, Iowa. Photograph used with permission of the University of Iowa Office of the State Archaeologist.

The customs of Irish Catholics are of particular interest, as they comprise the largest portion of the population interred in the Third Street Cemetery. The most familiar component of Irish funerary customs is the wake, the gathering at the house of all acquaintances accompanied by pipe-smoking, whiskey-drinking, storying-telling, game-playing, singalongs, prayers, and ritual wailing while constant watch is kept over the corpse (Mooney 1888:269-284). Though these traditions would not be observable archaeologically, other elements of Irish customs might be detected. Both Mooney (1888) and Bergen (1895) report the popularity of burial in a scapular among the Irish, and Mooney states that linen shrouds were usually used. The shroud was sometimes adorned with black ribbons (for adults), white ribbons (for unmarried persons), or flowers (for children). A plate of tobacco and/or salt was placed near the corpse or on its chest during the wake (Mooney 1888:268-269). The lid was never nailed on the coffin of a new-born baby, for fear that the mother would have no more children (Mooney 1888:284). Perhaps most interesting is Mooney's report of the continued practice of including small articles in the coffin to bring the deceased comfort in the afterlife (Mooney 1888:295). Grave layout is also addressed; the Irish favoured multiple interments in a single grave shaft but held that a mother should never be buried with her first-born child (Bergen 1895:20). In some parts of Ireland, when a new coffin was interred in a grave, a small hole was made in the lid of the coffin below (Mooney 1888:289). An area of unblessed ground along the northern border of a graveyard was reserved for the burial of unbaptised babies, suicides, and those not in communion with the church (Mooney 1888:287). Mooney (1888:290) also states that it was considered a sacrilege to disturb or pluck any plants growing in a graveyard, a custom that might explain what non-Catholic Dubuquers considered to be the overgrown and dilapidated state of the Third Street Cemetery.

2.4. Bereavement and Mortuary Display

Analyses of mortuary assemblages often focus on easily definable subjects such as status, social organisation, artefact chronology, and temporal variations in funerary deposits, while rarely addressing that which is a universal element attendant at death events – the emotional response to loss. Though mediated by cultural traditions and social norms and though highly variable in expression, emotions are part of the experience of mortuary ritual (Huntington and Metcalf 1979:23-43). While it is difficult enough to interpret "the universal in the cultural particular" (Huntington and Metcalf 1979:43) when defining emotional reactions to death in anthropological studies of living cultures, projecting any such understanding onto past societies based solely on archaeological evidence is surely a foolish endeavour. In historical archaeology, however, the ability to employ multiple lines of evidence allows some conclusions to be drawn.

Extensive archival research has shown that during the Romantic period in the nineteenth century, funerary expressions of sentiment and individualism were increasingly permissible. One of the manifestations of this trend was the concern of the bereaved for the comfort of the corpse, which was tucked into a coffin with sheets and pillows and placed in a rural cemetery at a location selected to provide a pleasant view for the deceased as well as mourning visitors (Tarlow 2000:234).

Other mortuary expressions of sentiment, such as epitaphs, were more overt. In her study of changing commemorative practices in Orkney through gravestones erected between the sixteenth and twentieth centuries, Tarlow emphasises the emotional context of bereavement, claiming that commonly cited themes, such as the negotiation of power relationships or the rise of the middle class, are insufficient to explain the massive increase in the number of grave monuments in the nineteenth century and the shift to more personal information in epitaphs (Tarlow 1999:171-175).

The goal of Tarlow's work is to reintroduce death as the subject of interpretations of mortuary rituals, rather than, as has become popular, extrapolating information about the structure of the living society based on activities that surrounded a death. Social archaeological theories explain the ways in which societies are created and reinforced through "everyday experiences," but the classification of funerary rites as routine experiences may be inappropriate, as these rites are performed in response to the severe social disruption following a death. Human emotion is invariably involved in a death event, but its study is not considered scientific, rational, or quantifiable, as subjects like power relations, economics, or technology are regarded (Tarlow 1999:29-32). While acknowledging the potential problem of "lack of fit between feeling and the expression of feeling," Tarlow states that archaeologists' avoidance of the subject of human motivations creates two-dimensional and dehumanising narratives (Tarlow 1999:25-26). Most anthropologists agree that human emotion is not universal but, rather, a socially-constructed response. If emotions are defined as intrinsic biological (neurochemical) processes modulated by cultural meanings, then, Tarlow argues, these culturally-significant expressions should be detectable in material culture. In the case of the Orkney graveyards project, Tarlow examined the subjective response to loss through a study of death metaphors (e.g., sleep or a journey) presented by the funerary monuments (Tarlow 1999:33-36). She found that changes in commemorative practices were not related solely to demographic or economic shifts but to changes in the relationship between the living and the dead, which accompanied the rise of individualism and the primacy of personal affective relationships beginning in the late eighteenth century (Tarlow 1999:173-174).

2.5. Age Identity in Archaeology

Most archaeological studies of cemeteries employ age brackets which essentially use data indicating a biological developmental or decline stage to create a chronological age range, which is then assigned a designation that, intentionally or unintentionally, has connotations of social age (Gowland 2006:144). For example, an individual with fully erupted second molars and unerupted third molars (biological stage) could be estimated at 13.5 to 18.5 years (chronological age, AlQahtani *et al.* 2010) and classified as an adolescent (social age, Buikstra and Ubelaker 1994:9), regardless of whether or not the culture under study recognised adolescence as a distinct developmental stage. To overcome the problems of such assumptions, Gowland (2006) suggests that age identity may be gleaned through the archaeological record as well as osteological analysis, by examining funerary evidence and age-related grave good patterns. The age statements made by material objects can extend beyond the standard dichotomy of adult vs. child and, in the studied cases of Anglo-Saxon and Bronze Age cemetery populations, appear to be intertwined with statements of gender (Gowland 2006:147-152; Sofaer-Deverinski 1997). Both of these studies found that some gender-related grave goods appear in burials of females at a younger age than their appearance in male graves (Gowland 2006:148; Sofaer-Deverinski 1997:882-884), which may signal an earlier social transition for girls.

When working with data from a relatively recent period in history, age identity can be more accurately determined through archival research than artefact analysis (see Chapter 6), though Baxter's (2019b) recently published volume combines studies of both aspects with a theoretical framework that can be projected into the more distant past. Nevertheless, Gowland's work reminds readers of another age-related aspect of grave good selection which is applicable to nineteenth-century mortuary studies. Age plays a role in funerary treatment not only as it relates to the life stage of the deceased, but also to the corresponding age of the principal mourners and their relationship to the deceased (Gowland 2006:152). When a child dies, the individuals making the funeral arrangements are almost always the parents, whereas a young woman might be buried by parents or a spouse, and a middle-aged woman is most likely to have her husband select her coffin.

2.6. The Archaeology of Adolescent Burials

No archaeological research to date has focused exclusively on the mortuary treatment of adolescents. A few studies have touched on the subject, though, and a number of compliance reports have provided anecdotal evidence of differential funerary rites for individuals in this age range.

In a study of correlations between grave goods, sex, age, and social status among the pre-Roman residents of Samnium, Scopacasa (2014) discusses the elaborate burial of an adolescent female. Almost all of the personal ornaments recovered from burials classified as Period I (sixth century B.C.) were found with this female, who was the only individual buried with amber or glass. Considering that none of the adult females were so adorned, Scopacasa suggests that the objects may be related to her status as having attained child-bearing age or may have served a prophylactic purpose related to perceived vulnerability at this age (Scopacasa 2014:248). In a study of the Romano-British female life course, McGovern (2019:44) notes an overall increase in the number of grave goods, particularly household objects, found in the burials of adolescent girls when compared with those of adolescent males, a pattern which some scholars interpret as the inclusion of dowry items.

On the other side of the world, at the prehistoric Native American site of Koster Mounds in Illinois, a 14- to 15-year-old of unknown sex was the only individual in a group of 11 burials in Mound 1 (ca. A.D. 550-950) to be interred with a large number and variety of artefacts (Sacks 2019:93). In addition to a flint-knapping kit and chipped stone tools, the bundle burial included a turtle plastron pendant, two projectile points produced by the earlier Hopewell culture (likely found pieces), and two flying bird effigies (Perino 1973:154-156). This adolescent was also the only bundle burial in the group of articulated individuals placed on the ground surface and covered by the mound in a single event (Perino 1973:154-157). Though researchers have noted the unusual nature of this teenager's interment (Cook 2019; Perino 1973; Sacks 2019), none has proposed any reason for the differential treatment.

Though their study of young women in medieval England focuses on bioarchaeological data, Shapland *et al.* (2015) briefly discuss grave goods as they relate to social identity. The inclusion of adult female grave goods in burials of adolescent girls in the early medieval period suggests that the transition to adulthood was initiated by the physical changes of puberty. Three young women who died in pregnancy are classified separately based on mortuary treatment. The two buried in a hospital graveyard without individual burial shafts or grave goods are presented as possible unwed mothers, while the woman in a coffined burial within a church is assumed to be a married woman in good standing (Shapland *et al.* 2015).

Another medieval-period study examined the connections between atypical burial practice and juvenile age at death at the Ballyhanna burial ground in County Donegal, Ireland (Murphy 2017). One quarter of the subadult burials were found to have at least one atypical feature, with adolescents (12 to 18 years) more likely to have unusual arm positions and grave goods that were inconsistent with Christian customs, including one teenager buried with a knife. Murphy (2017) suggests these features may be related to surreptitious interment, due to a family's inability to pay funeral fees, or to a desire to express care in the preparation of the grave.

In a study of mid-nineteenth to early twentieth-century grave markers in Chicago, Baxter (2019b:141-143) found that markers for children over the age of 10 were among the most elaborate for single individuals of any age. Examples from the excavations of three small cemeteries from the same period also hint at "special" treatment of American adolescents. Just four individuals were unearthed at a small family cemetery known as the Henry Woods site (13PK20) in Polk County, Iowa, including a newborn infant, a child five to seven years old, an adolescent female (15.5 to 17.5 years) and a middle-aged adult female. The cemetery was likely used circa 1843 to 1854, a period when the Beautification of Death had not yet reached the western frontier and when commercial goods were not readily available. No clothing hardware was recovered besides simple straight pins, suggesting burial in shrouds, and three of the coffins were constructed with utilitarian hardware only. The coffin lid of the teenage girl, however, was fastened with seven white metal coffin screws in three similar but not identical styles. The mismatched screws attest to the scarcity of mass-produced hardware at the time of burial and perhaps to the effort expended in providing a decorated coffin for the girl (Lillie *et al.* 2017).

The Scissons family cemetery in Gregory County, South Dakota, dates to a later period when the Beautification of Death movement was well established. Used from around 1869 to 1909, the burial ground was inundated by the creation of a reservoir in the 1950s. In 1982, dropping lake levels exposed three intact graves. All three coffins were decorated, and all individuals were buried in day wear, as evidenced by buttons, beads, and shoes. The adult woman was buried with coins (nickels) on her eyes and a crucifix and dressmakers' scissors in her coffin. A number of beads were found in the neck and thoracic region of the one- to two-year-old infant. The adolescent male was buried with quarter-dollar coins on his eyes. His grave also included a painted buffalo hide bundle containing a toothbrush, scissors, a mirror, pencils, two rosaries, a religious book, and a baptismal certificate. A framed religious icon and a silver cup were found near the teenager's feet. The abundance of grave goods in these burials – as opposed to most American graves from this period – is attributable to cultural variation; the patriarch of the Scissons family was from England, but the matriarch was Native American, a member of the Loafer Band of Brule Sioux. The larger number of items in the grave of the teenager suggests special mortuary treatment offered to adolescents, in this case in apparent preparation for a journey. Alternatively, it may simply be a reflection of the efforts of the principal mourner. Historical documents show that teenager Henry George predeceased his Sioux mother by two months, and thus she was likely involved in his mortuary preparations, whereas her own funeral arrangements were likely overseen by her husband (Nowak and Berg 1983).

The graveyard of the Volusia County Poor Farm was used from 1889 to the mid-1940s for the interment of individuals who died while residing at the poor farm as well as other paupers who were buried at the expense of the county. Unfortunately, a portion of this burial ground containing between 30 and 40 graves was largely removed during a construction project in 2014. Three intact and 18 disturbed graves were excavated following the heavy machinery damage. All of the interred individuals appeared to be adults with the exception of the highly disturbed, fragmentary, and incomplete remains of the individual in Burial 8, an older adolescent or very young adult. This individual was buried with a Seated Liberty quarter-dollar, apparently in the left trouser pocket. Though three other individuals in the cemetery were found with pennies and nickels – two with coins on the eyes and one with a drilled penny necklace – the relatively high value of the coin and its placement suggests some sort of preferential gesture (Campbell *et al.* 2016).

A 1996 anthropological study of the funerary and mourning traditions of 26 egalitarian societies from Human Relation Area Files examined the differences in mortuary treatment for children and adults. Fox (1996) proposes four possible motivations for extensive mortuary programs that are not related to rank, and that are potentially applicable to children as well as adults. 1) The need for biological continuity means that every member of a community is contributing, even if just by being alive, and thus is deserving of ritual. 2) Grief alone is sufficient cause for mortuary ritual. 3) Mortuary practices may express religious beliefs that are specific to children or that are applicable to all society members. 4) If death is seen as a rite of passage, rituals must be conducted in order for the deceased to transition out of the liminal state. Fox (1996) concludes that grief is a plausible explanation for some mortuary ritual, though the intensity of grief may be related to additional factors. Evolutionary psychologist Robert Wright (1994:174-176) proposes that parental devotion should peak at biological adolescence, when offspring have reached a state of maximum reproductive potential. However, data from the 26 ethnographic cases suggest that initiation into the group is the factor with the greatest influence on the mortuary treatment of children as adults (Fox 1996:60). This finding indicates, not surprisingly, that social thresholds are more important than biological ones in the definition of social identity and in the formulation of grief.

2.7. Summary

Though the first historic American cemetery excavation projects interpreted decorative coffin hardware as the equivalent of the high-status grave goods observed in prehistoric cemeteries, subsequent research illustrated a trend cycle of mortuary elaboration followed by restraint, demonstrating the temporal aspect of coffin decoration as well as its role in creating aspirational identities (Cannon 1989). Mass-production eventually made coffin hardware so inexpensive and universally available that inclusion in a burial is merely an indication of consumer choice rather than a sign of socioeconomic status (Bell 1990). Though later studies (Davidson 2004a; Pye 2007) used historic coffin hardware price lists and funeral home records to calculate the precise costs of funerals in an attempt to determine the true status of the deceased, this effort was confounded to some extent by the willingness of mourners to incur large debts for the provision of mortuary rites (Cannon 1989:438; Davidson 2004a:171).

The commercial forces behind the nationwide Beautification of Death movement cannot be denied, but nineteenth-century elaboration of funerary ritual was also related to the rise of sentimentality and Romantic individualism (Farrell 1980:34), and thus the level of elaboration in any given burial cannot be explained purely in temporal or socioeconomic terms. Society's new focus on the individual allowed for personal preferences to become a factor in funeral arrangements, whether these were the preferences of the deceased, expressed prior to death, or those of the principal mourners. This personal factor is particularly conspicuous in the selection of burial clothing. Though some researchers emphasise a temporal shift from shrouds to "day wear" (LeeDecker 2009), contemporary writings, post-mortem photography, and the few outfits preserved in iron coffins make it clear that the choice of burial clothes was not related to interment date or the socioeconomic status of the deceased but rather to personal preferences, age, sex, cultural background, and religion. Being that there was no canonical prescription for the inclusion of items such as rosaries and religious medals in burials, the presence of these objects is also demonstrative of personal choice within the bounds of what was considered culturally appropriate. The inclusion of a secular object in the coffin, which was strongly discouraged by the Catholic Church, signifies an unorthodox personal decision.

When interpreting motivations behind mortuary treatment, an important factor to consider is the identity of the person or persons making the funerary decisions. Older adults during this period often made arrangements in advance, or at least made their preferences known to spouses or grown-up offspring who would later handle the details. Children and adolescents who died, however, were usually buried by their parents, who selected the coffin, clothing, and grave goods based on what was available, appropriate, and financially feasible (Farrell 1980), in addition to providing any sentimental elements. Evidence for apparent differential mortuary treatment of adolescents seen in historic cemeteries may be explained by parental involvement in the arrangements, as studies in evolutionary psychology have shown that parental devotion (and thus bereavement) peaks when offspring reach biological adolescence (Wright 1994:174-176).

Chapter 3

Historical Context

3.1. The American Midwest

A mention of the Midwest region of the United States most often conjures images of rolling farmland, sparsely dotted, even in the twenty-first century, with idyllic farmsteads, large silver-timbered barns, and small communities. Today, the twelve states making up this region (Figure 3.1) – Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin – have far more to offer in the way of scenery and industry than corn, cattle, wheat, and hogs. This was true historically, as well, though perhaps more so for the Midwestern states to the east of the Mississippi River. These states were previously called the Northwest Territories or the Old Northwest, and the easternmost of these, Ohio and Indiana, were the targets of the earliest westward Euroamerican expansion in the years immediately following the Revolutionary War. Legislation such as the Land Ordinance of 1785, the Northwest Ordinance of 1787, and various military Bounty Land warrant acts were designed to attract orderly and industrious settlers to the region controlled by the federal government (Cayton and Onuf 1990; Swierenga 1968). In fact, it proved impossible to prevent the swarm of "speculators, squatters, and other lawless, lazy, and improvident 'white savages'" (Cayton and Onuf 1990:xvii) that descended on the territory, but the settlements were successful nonetheless and half of the original Northwest Territory had achieved statehood before the western portion of the Midwest was even opened to pioneers (Cayton and Onuf 1990).

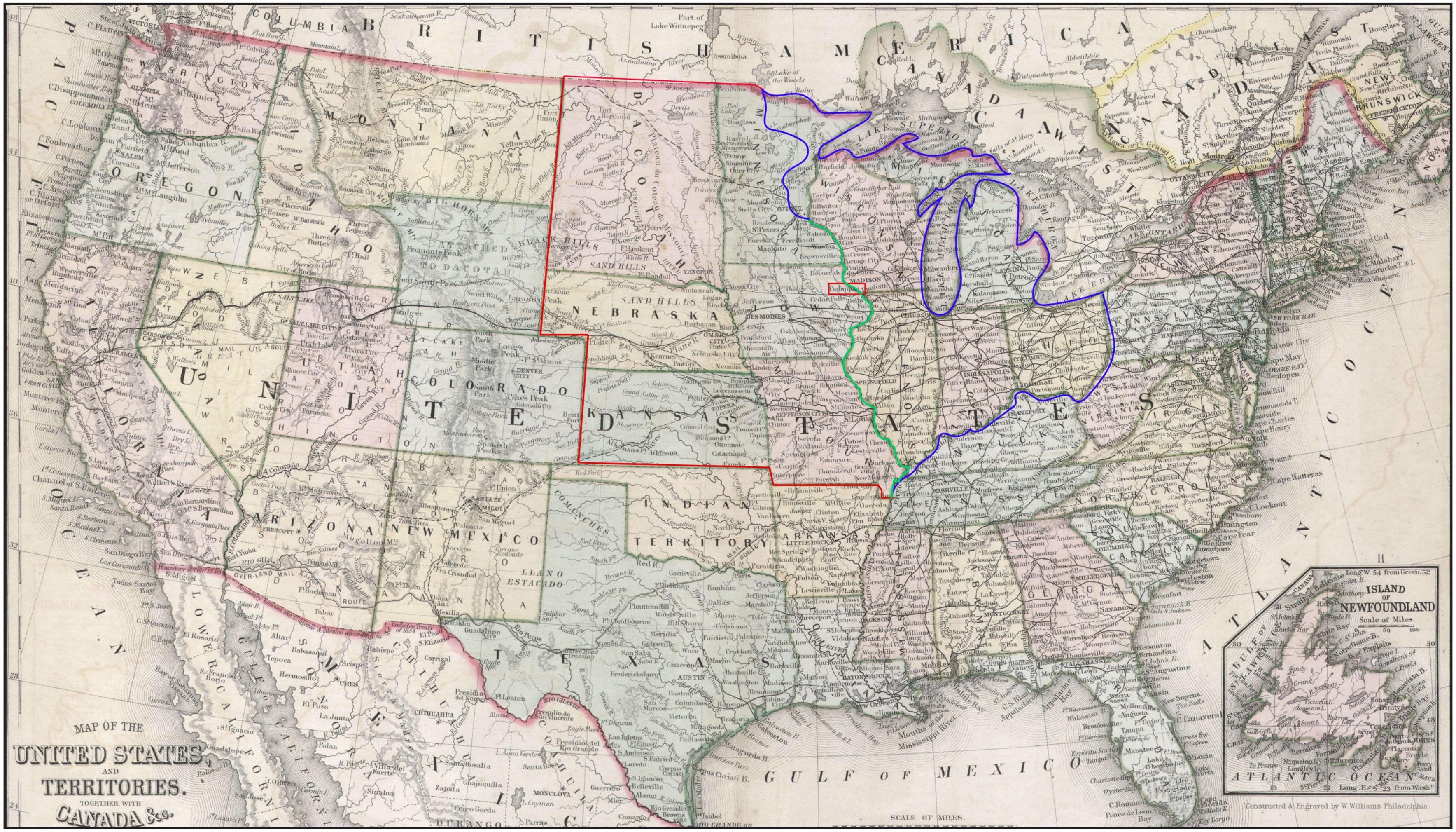

Figure 3.1. Map of the United States showing the Old Northwest outlined in blue and the later addition to the Midwest outlined in red. The portion of the Mississippi River that flows through the region is highlighted in green, and the red rectangle marks the location of Dubuque. Base map: Map of the United States, and Territories, Together with Canada &c, Samuel Augustus Mitchell, ca. 1867 (public domain, downloaded from Wikimedia Commons).

Being longer established and closer to the economic centres on the East Coast and to the Great Lakes, these eastern Midwest states saw the earlier development of large-scale manufacturing and urban expansion. With cities like Cincinnati, Cleveland, Detroit, Chicago, and Milwaukee rapidly growing in the nineteenth century, the Old Northwest states tended to have denser populations and more diverse industry than those states immediately to the west of the nation-dividing waterway (Cayton and Onuf 1990:104-106). Though the Midwest region is considered unified by common geography, environment, settlement pattern, and economic and social life, histories have often focused either on the original Old Northwest states or on states in the "Middlewest" on the other side of the river (Ubbelohde 1994). Because Iowa belongs, both geographically and culturally, with the frontier group to the west of the Mississippi, it is that region's history which is relevant to this study.

The land that comprises the western half of the Midwest did not become part of the United States until the Louisiana Purchase of 1803. Originally known as the Louisiana Territory, the land was renamed the Missouri Territory after the area of modern Louisiana became a state in 1812. Between 1821, when the modern state of Missouri was established, and 1834, when the remainder of the region became part of the Michigan Territory, the land north of the Missouri border, including the area of modern Iowa, was not organised under any local government. For most of this 13-year period, the territory was off-limits to American settlers, as the majority of the land had not yet been ceded to the U.S. through treaties with Native American tribes, let alone surveyed and organised for settlement and sale (Sage 1974; State Historical Society of Iowa [SHSI] 1970 [1870]).

Gradually, lands were opened for settlement. Aside from the town of St. Louis and numerous forts, few pre-existing European population centres awaited the first pioneers who poured across the Mississippi. These settlers were migrating from regions with stagnant economic opportunities in hope of improvements in living standards that did not always materialise (Cayton and Onuf 1990:26). Many small farm holders left their homes "back East" in pursuit of cheaper, more fertile land (O'Brien 1984; Sage 1974). The governmental organisation and reorganisation of the Midwest territories continued throughout the nineteenth century. Iowa achieved formal statehood in 1846 (Sage 1974), around the same time the U.S. was beginning to acquire and settle lands further west, through the Texas Annexation (1845), Mexican Cession (1848), and Gadsden Purchase (1853) (Hebard 1917:9). Throughout the century, increases in population density, expansion of transportation networks, and the spread of goods and ideas generally mirrored this east-to-west settlement pattern (Depew 1895; Galloway 1950; Springate 2015:57-59).

Historians have noted a tendency for people to migrate west in groups, and for populations originating from one region of the old U.S. to settle together in a new area, thus creating a cultural checkerboard in the Midwest, rather than a "melting pot" (Cayton and Onuf 1990:27). Adding to this checkerboard were a substantial number of recent immigrants. The 1870 pamphlet produced by the Iowa Board of Immigration, entitled, *Iowa: The Home for Immigrants,* shows that foreign-born individuals made up over 11% of Iowa's population in 1850 and over 15% in 1860. The countries contributing the highest numbers of immigrants were Germany, Ireland, and England (SHSI 1970 [1870]). Though it offers information concerning the history, geography, geology, amenities, and laws of Iowa, the true purpose of the pamphlet is made clear in its last chapter, "General Information and Practical Suggestions":

> There is still in Iowa uncultivated land enough for *three hundred and sixty thousand farms*, of eighty acres each! If the toiling millions of the East who are doomed to incessant labor and the practice of the strictest economy to secure the absolute necessaries of life, could only behold the millions of acres of rich untilled Iowa prairies, they would certainly spare no effort to place themselves in positions of independence (SHSI 1970:68 [1870]).

The 28,800,000 available acres referenced here, if accurate, represent 80% of the 36,000,000 acres in Iowa. Despite statehood and the rise of major towns, Midwestern states like Iowa remained under-settled in the late nineteenth century, with governing bodies more than happy to welcome new migrants, whether American or foreign-born (Riley 1981:100-109; SHSI 1970 [1870]).

3.2. Iowa and the Town of Dubuque, 1803-1880

Unlike the pioneers who founded communities in most of Iowa and the Midwest, the early settlers who established the town of Dubuque did not come there to farm, but to mine. Lead ore, which was found throughout the region, was exploited first by prehistoric Native Americans, then by historic-period Native American tribes like the Sauk and Meskwaki, then by the French-Canadian trader Julien Dubuque, who established a large mining operation a few miles south of the spot where his namesake town would be founded decades later (Alex 2000:226-227; Lillie and Mack 2015). Upon Dubuque's death in 1810, the mining rights reverted to the Meskwaki, who sought to keep native control of the mineral resources and avoided several offers from the American government to purchase the land by requesting an unreasonable price (Auge *et al.* 1986:23-32). Meanwhile, American settlers were increasingly anxious to lay claim to the ore-filled bluffs that were now a part of the United States, defying both the Meskwaki and the American government with covert incursions and, on one occasion, a forceful (though temporary) takeover of the mines (Hoffmann 1930:185-193; Sage 1974:45-46).

The relentless pressure brought by the land-hungry (and lead-hungry) Americans, combined with inter-tribal conflict between the Sauk and Meskwaki on one side and the Sioux on the other, exacerbated by the lingering allegiance of some Indian bands to the British (with whom they had sided in the War of 1812), eventually ignited the brief Black Hawk War of 1832. The "war," which lasted only fifteen weeks, was won by the American army and their Sioux allies. Though the battles were fought in Illinois and Wisconsin, to the east of the Mississippi, the land that the Sauk and Meskwaki ceded through the 1832 Purchase Treaty comprised 6.2 million acres in eastern Iowa, including the lands around the precious mines of Dubuque. Official American settlement in Iowa began less than a year after the signing of the treaty (Alex 2000:229-231; Ingersoll and Mack 2013:23; Sage 1974: 48-51). The appointed date of legal entry, June 1, 1833, could not come soon enough for many of the eager miners. Lieutenant Jefferson Davis, who would later become the President of the Confederacy, was sent with his troops to "Dubuque's Mines" to prevent the settlers, who were restlessly waiting in Illinois, from prematurely crossing the river (Datisman *et al.* 1950:7; Hoffmann 1930:185-193; Ingersoll and Mack 2013).

After the first year of settlement, the register for the General Land Office's Dubuque District claimed that he had granted innumerable mining permits, "perhaps over a thousand." Though ore deposits had been discovered for many miles to the north and south of the town, most of the early mining took place in the vicinity of Dubuque and Peru (Oldt 1911:20-21). The character of the newly-formed town of Dubuque was colourfully conveyed in these recollections of an eyewitness, reported in the *Dubuque Herald* in 1859, twenty-six years after the fact:

> The population almost without exception was of the roughest sort, being composed mostly of miners, whose amusements consisted in gambling and drunken frolics on the most villainous whiskey…The standard of morality was infinitely low, the taking of a life or any other species of crime was regarded less a wrong than a pastime. Acts of extreme lawlessness, however, were rare for there was a regular system of organization among the miners by which was administered a set of laws with inflexible impartiality (Oldt 1911:49).

Though titillating, this description may not be entirely accurate. Many of these first settlers went on to be wealthy, prominent members of Dubuque's community, who donated money and land for the erection of churches and the creation of charities (Lillie and Mack 2013). To be sure, the first year of settlement was bleak; cholera struck the community hard, and there was no medical aid available. General provisions reportedly ran very low the first winter. In the spring of 1834, the first steamer brought not only essential supplies, but also the first women to set foot in Dubuque (Gue 1903:158).

In one year, the population of Dubuque grew to approximately 300. The 1834 extension of the Pre-emption Act of 1830 allowed settlers already occupying land that was not yet surveyed by the U.S. government to purchase the property at a low price once the land was ready for official sale. Through this process, many mineral lots which had been relieved of their precious ore (or which were found to have none) became regular land claims (Oldt 1911:20-21).

Over the next two years, the town began to take shape. In 1836, both the city, with its centre encompassing thirty-five blocks, and the county were officially surveyed. By the end of that year, fifty shops, three churches (including St. Raphael's Cathedral), two schools, a bank, and a hotel had been built. The population was approximately 1,200 at the time of the first territorial census of the region (Oldt 1911:47-55). The first plat map of Dubuque was published in 1837 (Wilkie 1987:171).

An interesting feature of this plat (Figure 3.2) is the bluff-top lot in the southwest corner of the map, just south of Third Street, marked simply "Graveyard." Though church records indicate that the burial ground associated with St. Raphael's Cathedral was consecrated upon the arrival of Bishop Mathias Loras in 1839, its representation on this early map confirms that the Third Street Cemetery was in use prior to the survey of 1836 (Mack 2013a). The Catholic diocese of Dubuque, administered from the town of Dubuque and encompassing modern Iowa and Minnesota, as well as parts of the Dakotas, was established in 1837, though it took two years for the appointed bishop to get there, having first returned to France to collect funds and clergy. Upon his arrival, the new bishop established a small seminary, though Catholics made up only a quarter of the town's initial population (Datisman *et al.* 1950; Gallagher 1987:3-9).

Figure 3.2. 1837 Original Plat of Dubuque, with the Third Street Cemetery circled in blue and north arrow emphasised. Original at National Archives. Reproduced in Dubuque on the Mississippi 1788-1988 (Wilkie 1987:170).

In 1838, Dubuque became part of the newly created Iowa Territory. The shortage of women continued to be a problem, though men were as numerous “as blackberries in summer” (Oldt 1911:22). The mining industry continued to dominate the region in the 1840s, with six million pounds of lead shipped out of Dubuque in a single year. David Dale Owen, who completed the first geological survey of the area in 1839, declared it one of the richest mineral regions in the world (Klein 2011:16). By 1845, however, the mines were in decline, due to falling lead prices and the fact that the easily accessible ore had already been extracted (Klein 2011:16-22; Ingersoll and Mack 2013:24).

Iowa achieved statehood in 1846 (Datisman *et al.* 1950:9). No longer just a rough and tumble pioneer village, Dubuque grew exponentially in the 1850s, becoming the largest urban centre to the west of the Mississippi and north of St. Louis. Scores of brick structures replaced the wooden buildings downtown. By the middle of the decade, the city had a telegraph line to Illinois, a fire company, gas lamps, and 6,634 residents. Breweries, iron foundries, brick factories, rope works, steam sawmills, and a soap and candle factory all operated in Dubuque while farming increased in the surrounding countryside (Oldt 1911:84-107). Residents no longer had to leave Dubuque in search of secondary education. The 1850s saw the founding of the German Presbyterian College and the Dubuque Female College (Datisman *et al.* 1950:10-11). Christians in Dubuque could worship with nine different congregations – Catholic, Episcopalian, Methodist, Congregational, Baptist, Christian, German Catholic, German Methodist, and German Congregational (Ingersoll and Mack 2013:25; Oldt 1911:86).

While towns that arose from similar lead-mining booms (e.g., Galena, Illinois and Mineral Point, Wisconsin) gradually declined when the ore was gone, Dubuque continued to thrive, thanks to its location on the bustling Mississippi River. Steamboats connected Dubuque to the major cities – New Orleans, St. Louis, St. Paul – and many smaller towns in between. The California Gold Rush and the opening of more and more land for settlement brought thousands of travellers through Dubuque on their way further west. Train passengers no longer had to travel to and from Galena by boat once the railroad was extended to the eastern shore of the Mississippi at Dunleith, immediately across the river from Dubuque (Oldt 1911:212). Tracks were laid down within Iowa throughout the 1850s, and trains from Dubuque ran to several points within the state, though construction of the Mississippi bridge that would connect these rails to the eastern lines was not begun until 1867 (Klein 2011:23-24; Ingersoll and Mack 2013; Oldt 1911:211-212, 240-249).

The population of the city increased to 13,000 in 1860, 18,434 in 1870, and 22,254 in 1880 (Hull 1883:474). The economy now revolved around the meat packing and lumber industries, though the Cooper Wagon Works was also very successful (Datisman 1950). As a consequence of the growth, Dubuque residents had access to an ever-increasing variety of goods and entertainment. By the 1856 Iowa State Census, the town boasted eight professional musicians, eight actors, seven confectioners, and two sculptors (Grimes *et al.* 1857:122-125). According to the clerk at a local dry goods store, by 1858, “The country style was now eliminated as the city was now putting on metropolitan airs (Conzett 1900:16).” In the 1860s and 1870s, baseball games, fairs, musical performances, balls, charity dinners, plays, operas, lectures on science and history, and visits from circuses and travelling menageries were all advertised and reviewed daily on page four of the *Dubuque Herald.* The same newspaper advertised oysters and exotic fruits, as well as pianos and the latest fashions, all of which were available to those with disposable income (Ingersoll and Mack 2013:25). For the wealthy and poor alike, the city provided a trained police force, established in 1865, streetcars beginning in 1867, and public water works in 1871 (Datisman 1950:13; Oldt 1911:158, 170).

In 1833, Dubuque was a village of a few log cabins surrounded by mud, little more than a mining camp on the frontier, sixty miles east of Indian-held territory. Just fifty years later, the city boasted nearly all the amenities found in St. Louis and Chicago. The graves in the Third Street Cemetery span this same time period and, had the entire burial ground been excavated, might have perfectly reflected the changes in the economy and society.

3.3. Dubuque: Population and Health, 1833-1880

3.3.1. THE PEOPLE OF DUBUQUE

As Dubuque's population steadily grew, the city – and the county surrounding it – demonstrated greater diversity than other parts of the region. While foreign-born residents made up only a little over 15% of the population of Iowa as a whole in 1860, they accounted for 42% of the residents of Dubuque County, according to the census that year, though the proportion of immigrants declined to 35% in 1870 and 28% in 1880 (Hull 1883:216; SHSI 1970:67 [1870]). Germany and Ireland consistently contributed the greatest numbers of immigrants to the county, though one enumeration also listed an Australian, a native of the East Indes, and a person born in South America (Grimes *et al.* 1857:126; Mack 2013b:63). The number of individuals in Dubuque County listed as "colored" rose from 72 in 1840 to 169 in 1880, which actually represents a drop in proportion, from 2.4% of the population to 0.4%, after the decline of the lead-mining industry (Chaichian 2006:58; Hull 1883:211). Native Americans are not listed in any of the census data for the city or the county, but numerous encounters and incidents involving Indians can be found in the newspapers of the time and local histories (Conzett 1905:235; Mack 2013b:66-67; Oldt 1911:45). At any given time, Dubuque's population included a large body of transients – boatmen, traders, river travellers, missionaries, land speculators, and pioneers and miners headed further west. Though these nomads do not appear in the population presented in the census records, there is no doubt that some of them are represented in the population of Dubuque's cemeteries (Lillie and Mack 2013).

In 1846, the city of Dubuque was divided into three wards represented by city aldermen. These wards followed the general ethnic divisions of the town's layout. The First Ward, to the south, included the largely Irish-occupied area called "Little Dublin," which had a reputation as a shanty town filled with unskilled labourers. The Third Ward, to the north of town, was called "Germany" for obvious reasons. The Second Ward, which lay between the others, was humorously called Babel (Hotopp *et al.* 1977:406; Oldt 1911:79, 132, 149). Early settler Lucius Langworthy downplayed these divisions, describing the community as a unique place where "…The German liberalism, the New England Puritanism, and Celtic nationalism mixed and mingled in all the elements of society” (Datisman *et al.* 1950:10). However, historic accounts of the Irish part of town demonstrate that not all residents embraced the sense of unity espoused by Langworthy. The memoirs of Josiah Conzett, a Swiss-German who moved to Dubuque in 1846 at the age of five, illustrate his impressions of the First Ward in the following passage:

> Now the Rest of the St. to the End off Dublin now South Locust was all Built up, but in One & Two Story Frame Buildings and below 1st St mostly Hovels and Shanties here Lived the Irish Population and for Years Decent People hardly dared go down that St. from 1st St. for 3 or 4 Blocks down the place was all Doggeries & Low Class Boarding House – Our Second Home in the Town was in A 2 Story Frame on the 2nd Floor A Negro Family lived on the 1st Floor. We lived there only 3 or 4 Months it was Tough for us – us boys hardly dared go out on the Street (Conzett 1905:264).

Disagreement between German and Irish immigrants led to the splintering of the Catholic community, with the Germans establishing their own church, Holy Trinity, in 1850 (Hoffmann 1938:4-36; Ingersoll and Mack 2013:25; Oldt 1911:86). This was by no means the only cultural clash to take place in Dubuque. The Civil War brought out deep divisions in the community. Iowa was part of the Union, but many of the town’s early settlers had southern roots. Young men from Dubuque fought on both sides of the conflict, though it appears the majority volunteered to join the Yankee forces. Even the local newspapers took sides, with the Republican *Dubuque Daily Times* supporting abolition and the war, while the Democrat-run *Dubuque Herald* criticised Lincoln and the attack on the Confederacy (Datisman 1950:12; Oldt 1911:256-322). It is unknown exactly how many soldiers from Dubuque were lost in the Civil War. However, both soldiers who died in the conflict and veterans of the war were buried in the Third Street Cemetery.

Unlike in Europe and the East Coast, Dubuque appears not to have suffered from significant conflict between religious denominations. Though the Know-Nothing Party existed in Iowa, its policies were focused on limitation of suffrage for immigrants and on greater periods of residency before naturalisation. The party platform in Iowa did not include the usual anti-Catholicism, except perhaps in reference to Europeans’ Sunday drinking habits (Sage 1974:129-132). Doubtless prejudices existed on a personal level; some newspaper editorials concerning the dilapidated state of the Third Street Cemetery imply a deficiency in the character of the parishioners who allowed the burial ground to fall into such disrepair (e.g., *The Dubuque Herald* [*DH*] 1876). For the most part, though, Catholics fared well in Dubuque, filling many important community positions, including mayor (Lillie and Mack 2013). Of course, these circumstances may have been influenced by sheer numbers. According to an 1860 news article, which listed membership numbers for the eleven Protestant and three Catholic churches in Dubuque, the Protestant congregations included 2,509 worshippers, while Catholics totalled 7,600 (*DH* 1860; Lillie and Mack 2013:64).

3.3.2. HEALTH IN EARLY DUBUQUE

In *Frontierswomen: The Iowa Experience,* Riley (1981) paints a grim picture of health and medical treatment in the nineteenth century. The earliest settlers in Iowa had no doctors or pharmacists and had to make do with remedies concocted from wild plants or garden-grown herbs. Recipe books were filled with as many directions and formulas for medicines as for food preparations. Remedies included various teas, rubs, poultices, and bindings, as well as (of course) whiskey. As settlement expanded and commercial goods became more available, substances such as quinine and morphine were added to the home apothecary, along with any number of patent medicines promising to stop coughs, cure influenza, purify blood, kill worms, and even get rid of haemorrhoids. Many of these "medicines" contained alcohol and may have brought patients slight relief from discomfort, though their efficacy otherwise is unknown (and unlikely). Few doctors practiced on the frontier, and their level of medical training was sometimes suspect. Even legitimate doctors still relied on methods now deemed damaging, such as bleeding. High birth rates – with some women giving birth as often as every two years – led to high demand for midwives, and an increasing number of doctors claimed to specialise in delivery (Riley 1981:77-83).

The first doctor arrived in Dubuque in 1833, and a county medical society was formed in 1852 (Oldt 1911:421-423). Money was raised for the first hospital in 1845. Temporary hospitals for cholera and smallpox were opened in 1852 and 1856, respectively. As of the 1856 Iowa Census, Julien Township, which included the city of Dubuque and its immediate surrounds, had 22 physicians and five dentists watching over the health of its 6,500+ citizens. Mercy Hospital, which is still operating today, opened in 1879 (Grimes *et al.* 1857:122-125; Oldt 1911:76-181). Thus, it appears that professional medical care was available to at least that portion of the population which could afford the fees, though a poor understanding of disease transmission left the wealthy just as vulnerable as the poor to infectious diseases.

From the 1830s through the 1860s, all of Dubuque's citizens, rich or poor, were living with the same rudimentary municipal sanitation. Prior to the establishment of public water works in 1871, the entire city relied on wells. The original sewers were improved in 1852 and again in 1866, but it appears that these were nothing more than storm drains. A true sewer system capable of carrying wastewater directly from downtown homes was not constructed until 1886. Prior to this, privies serviced most households in town. Trash and animal waste removal were apparently not the responsibility of the city. In 1865, the streets were so filthy that a group of citizens formed a brigade to clean them (Oldt 1911:94-188).

Though the leading causes of death in the community were simple diarrhoea and the ever-present scourge of tuberculosis, it was cholera that inspired the most fear. To this day, both written and oral histories of Dubuque allude to devastating cholera epidemics sweeping through the city on an annual basis, despite the fact that no evidence for these decimating outbreaks exists. While it is true that the most severe episodes reportedly took place before the time period covered by local death records, other sources from this era, such as city council minutes and newspapers, exist (Mack 2013b:70-72). A history of the county that makes use of these sources mentions seven outbreaks of cholera, with the worst occurring in 1833 and leaving about 50 dead in the whole county (Oldt 1911:48-96, 421-425). Relatively high numbers of deaths in the city in the summer months of 1851 and 1855 may have been related to cholera, but again these are in the 30 to 40 range, nowhere near the scale the outbreaks acquired in communal memory (Mack 2013b:71-72). The memoirs of Josiah Conzett recall the terror of "that Terrible Disease wich Visited Dubuque evry Summer from 1849 To 1857. it became so bad that People were afraid to go to Bed Nights. Hundreds died evry Summer from it" (Conzett 1905:197). Since these memoirs were written over 50 years after the fact, and since Conzett was only eight years old in 1849, it is likely his narrative was influenced by memories of neighbourhood panic, exaggerated stories told by old pioneers, and events in distant cities, like St. Louis where 651 died of cholera in a single week in 1849 (Harl *et al.* 1996:12). The number of cholera dead in Dubuque neither filled local burial grounds nor necessitated the digging of mass graves in the Third Street Cemetery, though both of these "memories" persist in local oral traditions and are now further enforced via repetition in online sources (Lillie and Mack 2015).

3.4. Funeral Industry in Dubuque, 1857-1880

The first full-service funeral home in Dubuque opened around 1882, just after the Third Street Cemetery fell out of use (Mack 2013c:76). However, the absence of formal institutions does not mean that all the dead in Dubuque prior to that year were laid to rest in simple shrouds and rough pine boxes constructed by relatives. In fact, the five decades between the town's establishment and founding of Hoffmann Mortuary saw many changes in the fledgling funeral industry, locally as well as nationwide (Depew 1895:651-652).

In the earliest days of the settlement, when women were few, and the community consisted primarily of miners, burials were likely simple affairs. Coffins, if used, may have been lightly constructed, given the scarcity of nails. No funeral details are recorded for the first Euroamerican to die in Dubuque; the man, known only as Mr. Fox, was buried in the lot that would become the nondenominational City Cemetery (Oldt 1911:51, 857). With the arrival of tradesmen in the town, coffins not made by the family were built to order by local carpenters or cabinetmakers, as was usual elsewhere in the country. The measurements for these custom-made coffins were sometimes collected by the craftsmen and sometimes provided by the family by way of a stick cut to the appropriate length, with width and depth notations written on the side (Coffin 1976:99-101). Plain and decorated coffins recovered from the Third Street Cemetery included hexagonal containers with both mitred and kerfed shoulders, as well as rectangular caskets and small trapezoidal boxes, indicating a mix of homemade and professionally manufactured coffins (Lillie *et al.* 2013:168; Mainfort and Davidson 2006:104-107).

Nineteenth century business directories from Dubuque show that some tradesmen recognised the profits to be made in expanding the coffin production that began as merely a side-line business. Men like Valentine Herancourt, Conrad Lange, and

Sigmund Kormann were listed in the early directories as cabinetmakers or furniture manufacturers, and in later issues as undertakers. The first direct reference to the funeral industry in the Dubuque business directory appeared in 1857, when F. & G. Fals and V. Herancourt were listed as coffin makers (Adams 1857). The first listing under the heading of "undertakers" appeared in 1858 (Webster and Co. 1858). As these businesses evolved, they began to provide more than locally manufactured coffins. An 1867 advertisement for Herancourt and Woodward states that the company sold "ready made coffins, metallic burial cases, and caskets" (Root 1867:83). Metallic burial cases were not manufactured in Dubuque. These luxury caskets had to be purchased from the nearest licensed manufacturers in Cleveland, Cincinnati, or New Orleans (Allen 2002:4, Mack 2013c:75). Advertisements in the 1873 business directory mention both the elegant hearses available from undertaker Sigmund Kormann, and undertaker Conrad Lange's "duty in the obsequies of the departed," making it clear that these men were now funeral organisers as well as coffin manufacturers and dealers (Childs and Arntzen 1873:47, 65). Of course, the new undertakers were not the only businessmen profiting from the deaths of their fellow citizens. Stone cutters produced memorials for those who could afford more than simple wooden grave markers. City Marble Works, for instance, advertised the production of "monuments, tombs, and headstones" as early as 1856, and by 1857 offered iron railings for cemeteries, as well (Adams 1856, 1857; Mack 2013c:77). An 1875 advertisement for William A. Harkett, florist, specifies that he could provide flowers for funerals in both summer and winter (Wolfe 1875). In 1877, the Dubuque Furniture and Burial Case Company was established, dedicated to the large-scale manufacture of coffins for wholesale and retail (Western Historical Company 1880:887).

The percentage of Dubuque's population that chose to make use of these newly available services – and could afford to do so – is unknown. Given the small number of undertakers, it appears that many of the bereaved continued to order simple coffins from local carpenters. Less than 20% of the coffins excavated from the Third Street Cemetery were embellished with the kind of decorative hardware that would indicate a high-quality manufactured coffin. Even the wealthy among the Irish Catholics of

Dubuque may have been disinclined to hire an undertaker, since nearly all such businesses listed in the city directories were German-owned (Lillie *et al.* 2013:167-215; Mack 2013c:76).

Prior to the rise of funeral homes, most funerals in America took place at the residence of the deceased, or sometimes the home of a relative or close friend (Coffin 1976:71-96; Farrell 1980:147-148). Obituaries and funeral announcements from local newspapers demonstrate that this was the tradition in Dubuque, as well, even when the services of an undertaker were obtained. Sometimes the deceased was taken directly from the home to the cemetery for interment. In other cases, the procession stopped at the Cathedral or one of the other churches for a funeral service before the burial. Funeral announcements also indicate that most people who died in Dubuque prior to 1880 were buried within a day or two of death. Embalming was not performed in Iowa until 1879 and is not recorded for Dubuque until 1882, though it is possible that individuals who died far from home (such as Civil War casualties) were embalmed before being shipped back for burial at Third Street (Konefes and McGee 1996:16; Mack 2013c:76-78).

A funeral bill from 1852 shows that the fee for digging the grave was $2.00, the rental of the hearse was another $2.00, and the cost of a family burial plot in the Third Street Cemetery was $10.00 (Mack 2013f:285-286). Unfortunately, a detailed description of the average funeral in Dubuque cannot be found in any of the primary sources. Only the obsequies of Dubuque's most prominent citizens were recorded for posterity. The following excerpts from the 1878 news feature covering the funeral of a wealthy Irish Catholic, John Mulligan, depict an extravagant affair quite unlike those that commemorated most deaths in the community.

> The funeral obsequies of the late John Mulligan were impressively solemnized on Tuesday (yesterday) morning, at St. Raphael's Cathedral. The remains were encased in an elegant casket, richly ornamented, and surrounded by flowers and floral designs, the tributary offerings of mourning relatives and friends.
>
> It was covered with fine black broad cloth, relieved with two-inch silk velvet, the sides beautifully draped with silk fringe, ornamented with full length solid silver hexagonal bar handles, the top ornamented with shield, cross, and crown emblems and a beautiful name plate, with the emblemic design "No cross, no crown" (very appropriate) with the inscription:

John Mulligan
Died July 7th 1878
Age 48 years

> The interior of the casket was handsomely upholstered in silk and satin and decorated with myrtles, ferns, and mountain daisies. A large cross composed of tuberoses rested on the cover.
>
> The funeral services at the house were conducted by Rev. Father Ward, at 9 o'clock. The deceased was then placed in the hearse and escorted to the Cathedral… A requiem high mass was celebrated by Rev. Father Cosgrove, of Davenport (a cousin of the deceased) … The altar and surroundings were draped in mourning, which added more to the solemnity of the occasion, and reminded the large number present that it was but a step from life to eternity. At the conclusion of the mass, an impressive discourse was delivered by Father Burke…
>
> …At the conclusion of the services the remains were borne to the hearse by the pallbearers, Messrs. James Rowan, Martin Carroll, Dennis Linchan, Thomas Cavanaugh, Frank McLaughlin, and James Harragan; after which the cortege moved to Key West cemetery… There was a large number of mourners from abroad, coming as far as from St. Louis to participate in the last sad rites to a departed friend.
>
> The regular services were pronounced at the grave, the closing prayer being enunciated by Father Cosgrove; and anon, all that was mortal of the good man, the upright citizen, the warm and steadfast friend, was shut in the tomb, there to remain until he who tempers the wind to the shorn lamb shall bid it arise. Requiescat in Pace (*DH* 1878b).

Though Mr. Mulligan happened to be buried in the new Catholic cemetery south of town, similarly grandiose funerals ended with the cortege winding up the bluff to the Third Street Cemetery, where the wealthy lay in the same consecrated ground as the faithful who died in the Poor House or in the hangman's noose (Lillie and Mack 2013).

3.5. St. Raphael's Parish and the Third Street Cemetery

When the vast Diocese of Dubuque was created in 1837, only one quarter of its namesake town's population was Catholic (Gallagher 1987:3-9). The first masses were held in the cabin of a man named Patrick Quigley in 1833, until work could begin on St. Raphael's Cathedral in 1835 (Mack 2013a:28). However, the flock quickly grew to represent three-quarters of the church-going population of the City of Dubuque, according to the previously mentioned 1860 Dubuque Herald article. While the small French-speaking contingent was the result of migration along the Mississippi and from Michigan and Canada, the Irish and German Catholics were intentionally imported. From the beginning of his episcopacy, Bishop Loras published letters in Irish-American newspapers back East and in German-language

Catholic periodicals, inviting immigrants to come to Dubuque. Loras also supported the formation of an Irish immigrant organisation that aided those attempting to move west (Gallagher 1987:12). Irish immigrant populations on the East Coast of the United States swelled drastically in the mid-nineteenth century due to the Great Famine, which led to the emigration of over a million Irish. The Catholic Church in New York strongly encouraged these new immigrants to move along westward rather than staying and clogging up the already crowded city (Ó Gráda 2006:155). Though the populations of many American cities were increased by the influx of new Irish, the character of Dubuque in particular was moulded by the presence of this large and tight-knit immigrant group (Gallagher 1987; Hotopp et al. 1977:414).

In addition to the well-known Irish and German members, St. Raphael's Cathedral also included a small number of "colored" parishioners. As of the 1840 Census, the Black and mulatto community made up 8.6% of the city's population, though that was to decline in later years (Chaichian 2006:58). A handful of death records and obituaries indicate both that some of these families were Catholics and that some of their dead were buried at the Third Street Cemetery (Lillie and Mack 2013:66).

Indeed, all Catholics who died in Dubuque and the surrounding countryside were buried in the Third Street Cemetery during the first half of its active period of use, from the 1830s to the 1850s. The precise date of the first burial remains unknown. The first plat of Dubuque proves that the burial ground was established before the survey of 1836. It may be that the graveyard was created during the first year of settlement, as was the City Cemetery (Key City Genealogical Society 2001:3). Dubuque's first priest, Charles van Quickenborne arrived at the settlement in July 1833 and thus would have been on hand to consecrate the ground for the interment of Catholic dead soon after the pioneers arrived (Gallagher 1987). Unfortunately, a property deed search cannot answer the question of the founding date, because the diocese never purchased or entered any type of formal claim to the 405 foot by 382 foot lot on the bluff, a fact which would become inconvenient for parishioners later in the century.

The only official records pertaining to burials in the Third Street Cemetery date to the period from 1839 to 1856. The St. Raphael's Cathedral Burial Register provides name, age at death, date of death, and date of funeral for most of the listed individuals, and occasionally offers additional information such as country of nativity or cause of death. At the back of the register, a small number of burial fee accounts and lot sales are recorded. The lots are numbered, but no corresponding map of the cemetery plots exists. Unfortunately, it is clear from missing months and unusually low death rates for some periods that the records are incomplete. The register documents the deaths of 698 named and 28 unnamed individuals, a mere fraction of the estimated 4,000 to 7,000 people who would be buried at Third Street by the end of its use (Mack 2013d:83-86; Phoenix Project 2005).

In the late 1850s and early 1860s, the Catholics of Dubuque began utilising three new properties for burial. The previously mentioned Key West Cemetery (later renamed Mt. Olivet) was opened south of town on the property of the Mount St. Bernard Seminary, which closed in 1856. The German Catholics, who had formed their own church several years before, established St. Mary's Cemetery (later renamed Mt. Calvary) far to the north of town in 1861. Around the same time, the Third Street Cemetery began to expand unofficially onto an adjacent blufftop property to the west, Outlot 723, owned by Thomas Kelly. Exactly when this expansion began is unknown, but a cryptic letter from land agents to Bishop Loras concerning an unidentified property owned by the Kelly family dates to 1856 (Mack 2013a:29-32). This addition to the original cemetery lot was finally purchased by the diocese after the death of Thomas Kelly in 1867 but, strangely, was never depicted on subsequent maps of Dubuque as part of the burial ground (Lillie and Mack 2015:29; Mack 2013a:33).

Over the remaining years of the cemetery's use, the property became the subject of a number of scandals which have little bearing on the current project. The burial ground was overcrowded and fell into disrepair, with the fences down and cows wandering among the graves, "leaving their card at every step (*DH* 1878c)." A man involved in a lovers' triangle was stabbed in the graveyard late one night in 1872. Meanwhile, the new bishop, John Hennessy, feuded with Mayor William Knight over taxes for road improvements on Third Street. The bishop's brother and the cemetery sexton were arrested for destroying the stairs leading up to the graveyard to prevent the passage of a funeral cortege. Mayor Knight, upon discovering that the diocese did not legally own the original cemetery lot, leased the mineral rights to a couple of business partners, and lead mining commenced twenty feet below the graves. Members of St. Raphael's Cathedral petitioned the United States Congress for recognition of title to the cemetery, but this was not granted until almost 40 years later, in 1908 (Mack 2013a:32-40).

The last recorded burial at Third Street occurred in 1880, the year that Dubuque County began keeping death records (Mack 2013a:38). The cemetery became a nuisance property, overgrown and all but abandoned. Meanwhile, the newer Catholic burial ground south of town was improved and landscaped, modelled after the park-like rural cemeteries that were fashionable in the eastern states. Various plans were proposed for moving the graves from the old cemetery to the new, but apparently few of the dead made the journey. Out of the 939 graves excavated by the OSA, only 76 (8%) were found to have been previously disinterred. However, the shifting wording of newspaper articles about the Third Street Cemetery between 1900 and 1930 led locals to believe that most of the burials had been removed at some point in the past. Administrators of the Archdiocese of Dubuque devised several schemes to use or sell the property, but were unsuccessful until 1946, when Chancellor D.V. Foley unloaded the land on the Dominican Sisters from Sinsinawa, Wisconsin, promising that the few remaining graves would be removed before the sale went through (Lillie 2013a:12; Lillie and Mack 2015:61; Mack 2013a:39-45).

3.6. The Tender Mercies of Our Successors: Twentieth-Century Disturbance of the Third Street Cemetery

In a City Council speech in 1870, Mayor Knight, faced with backlash concerning his sale of the mineral rights to the Third Street Cemetery, implored his fellow Catholics to consider moving the graves out of the cemetery on the bluff, rather than leaving them "to the tender mercies of our successors, who perhaps may not be as careful of them (*Dubuque Daily Times* 1870a)." This statement came to be prophetic. When Archdiocese Chancellor Foley discovered in 1948 that the 12 marked graves he had moved to Mt. Olivet Cemetery were just a fraction of those lying in the earth slated to be levelled for the Dominican Sisters' lawn, he made the decision to bring in the bulldozers regardless (Mack 2013a:44-51). In 1968, the Sisters subdivided and sold off portions of the property they had never used, including almost all of the original cemetery lot. Shortly thereafter, when ground levelling for new condominiums on the lot disturbed a few burials, the contractor called a funeral home to take the remains to Mt. Olivet. When the scale of the problem became clear, however, heavy machinery was once again used to remove the inconvenient graves. The bone-filled soil bulldozed out of the cemetery in the 1970s was used as fill dirt for a construction project across town. The whereabouts of the skeletal materials removed in the 1940s remains unknown (David Fondell, legal deposition, August 17, 2010; Mack 2013a:45-54). Witnesses to both of these incidents kept quiet about the destruction until decades later, so a homebuilder who purchased part of the property was shocked when four graves were discovered along his driveway in 1994 (Lillie and Mack 2015:54-59).

The Dominican Sisters sold the remainder of their property in 2002 to a developer who planned to erect luxury condominiums on the highest part of the bluff. The possibility of graves was discussed during the land sale negotiations, as a sliver of the property being sold retained the name “Lot 2 of Roman Catholic Grave Yard” on the official plat. This lot represented such a small portion of the land that it raised only minor concerns (Mack 2013a:57-58). Of course, the location of the cemetery was egregiously misrepresented by this little lot. As shown in Figure 3.3, the majority of the construction project area fell within the later addition in Outlot 723, which was never shown on maps of Dubuque as part of the burial ground.

Aside from having rather expensive consequences for the land developer (and the Dominican Sisters, whom he sued), this revelation is pertinent to the current study. Though the Third Street Cemetery’s period of active use spans from the 1830s to 1880, the majority of the excavated graves, being in the later addition, likely post-date 1856.

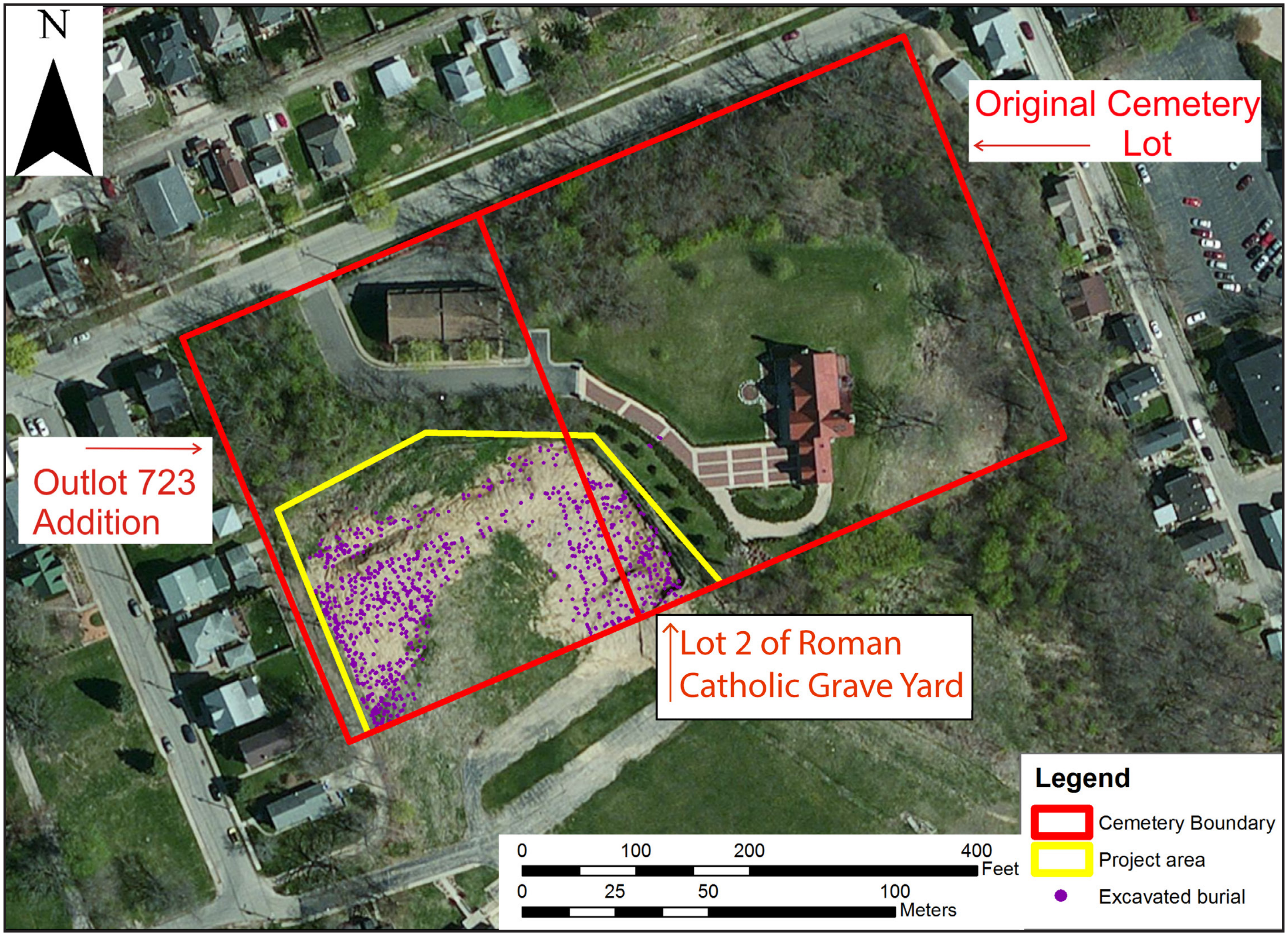

Figure 3.3. Aerial photograph of the Third Street Cemetery with the boundary lines of the original cemetery lot, Outlot 723, and project area superimposed. Note the small portion of the original cemetery included in the project area (Lot 2 of Roman Catholic Grave Yard). Image reproduced with permission from the University of Iowa Office of the State Archaeologist.

Chapter 4

Key Concepts in Palaeopathology and Relevant Adolescent Studies

Before turning to the methods employed in the current study, a brief discussion of the palaeopathological principles involved is warranted. Though this research focuses on teenagers, a study of the life courses of these individuals must include not only skeletal evidence of health in the life leading up to an early demise but also comparisons with infants and children (individuals who failed to reach adolescence) and adults (individuals who survived adolescence) in the same population. Unfortunately, cause of death cannot usually be determined for archaeologically-recovered skeletal remains, except in cases of perimortem trauma or overwhelming evidence of fatal disease, and patterns of general skeletal pathology can often be explained by competing, equally plausible hypotheses at the population level. This chapter will detail the ways in which the current project engages with the issues raised in “The Osteological Paradox” (Wood *et al.* 1992) in order to avoid the pitfalls of oversimplified interpretation (DeWitte and Stojanowski 2015). A brief review of scholarship concerning the skeletal markers of stress and disease used in this study is also included, as well as a discussion of recent bioarchaeological research regarding puberty and adolescent health and mortality.

4.1. The Osteological Paradox and the Third Street Cemetery

At the end of their 1992 paper, Wood *et al.* emphasise that tight control over context is an important tool bioarchaeologists can use to better understand skeletal populations. The advantage of studying a historical-period cemetery is that not only archaeological context, but also cultural context and historical documentation can be used as additional lines of evidence for the explanation of bioarchaeological data which might be open to competing interpretations.

4.1.1. DEMOGRAPHIC NON-STATIONARITY

The problem of demographic non-stationarity essentially means that age-at-death distributions are strongly affected by changes in fertility rates and migration. Demographic fluctuation in prehistoric communities can be difficult to detect, making demographic projections of living populations from cemetery populations problematic at best. For nineteenth-century American communities, however, 10-year census totals provide both the demographics of the living population and clear evidence of the non-stationarity which might affect the cemetery population. During the 47-year use period of the Third Street Cemetery, the population of the City of Dubuque rose from around 1,200 in 1836 to over 22,000 in 1880 (Mack 2013b:63). During this same period, the Catholic community of Dubuque – which utilised the cemetery – grew from one-quarter of the general population to approximately three-quarters, with much of this growth due to immigration (Mack 2013b:64-65). This period was also one of consistently high fertility, with studies of the American west showing that most families produced a child every two to three years (Riley 1981:81; 1988:49).

This unidirectional demographic change could be expected to manifest as an apparent increase in the number of adolescent deaths over time, even if the percentage of adolescents dying remained the same. However, due to the relatively short-term usage of the cemetery and the impossibility of dating most of the interments, no such temporal analysis was undertaken. Though the steady growth observed in Dubuque is not consistent across all of communities whose cemeteries are examined in this study, non-stationarity is not considered problematic, since the recreation of demographics of the living population at large was not attempted using cemetery data. Any study that involves comparison of different age groups within a cemetery population necessarily hinges on the assumption that all individuals were born, grew up, and died in the same community, and thus subadults and adults potentially represent non-survivors and survivors from the same cohort. This assumption was made for the current study, with the caveat that migrants of all ages arrived in Dubuque from across the U.S. and Europe during the period in question. Thus, any pathological changes observed in a given skeleton could potentially relate to living conditions in an entirely different environment.

4.1.2. SELECTIVE MORTALITY

The selective mortality problem is one of a biased sample; the teenagers in the skeletal collection from the Third Street Cemetery represent those who succumbed at that particular age, rather than being a random sample of the Catholic adolescents of nineteenth-century Dubuque. The health of these dead adolescents, whether they perished from disease or external mechanisms of death, is not necessarily representative of the health of their age class as a whole. Fortunately, this study does not seek to illustrate the health of the living population of Dubuque, but rather to explore health circumstances which may have selected some individuals for death. Palaeopathological analyses include comparisons of the adolescent dead with other groups of non-surviving subadults and with adults (i.e., adolescents who survived), in order to investigate potential age-related patterns of disease susceptibility.

4.1.3. HETEROGENEITY OF FRAILTY

The issue of hidden heterogeneity relates to the fact that some individuals (or subgroups within populations) are more susceptible to disease. Among other implications, this means that some frail individuals might die quickly from a disease, with no skeletal lesions, while healthier individuals survive the disease with skeletal lesions resulting from their period of illness. The assumption, then, that an individual without skeletal lesions is healthier than one exhibiting lesions is flawed; the relationship between the degree of health stress and the likelihood of developing skeletal manifestations is more complex.

Though the Third Street Cemetery was used for a relatively short period of time, primarily by the members of a single Catholic parish, its population is neither culturally nor biologically homogeneous, and does not represent an egalitarian society. The possible sources of hidden heterogeneity are numerous when considering the cemetery population as a whole. Heritable frailty specific to particular ethnic groups or families, cultural differences in child-rearing and weaning practices, differential exposure to infectious disease due to small-scale geography (neighbourhoods), differential access to nutrition and medical treatment based on socioeconomic status, and differential exposure to risks related to occupation (e.g., lead-poisoning from mining), diet, and alcohol consumption are all variables which can reasonably be expected to have affected an individual's susceptibility to death and yet cannot be detected from the archaeological context.

The selection of the particular subgroup for this study allows for some of the above-listed variables to be cautiously disregarded. One may assume, for instance, that individuals with high congenital frailty would have died and joined the cemetery population at a younger age rather than surviving to adolescence. This heritable frailty – sometimes due to variations in genetically encoded major histocompatibility complex antigens which can increase susceptibility to some diseases (McDade 2003) – might have little effect in a community with low selective mortality, in which unhealthy individuals were sustained by advanced medical care. However, evidence suggests that nineteenth-century Dubuque had relatively strong selective mortality, as did most urban parts of the U.S. with large immigrant populations (Preston and Haines 1991). Individuals who reached adolescence had lived beyond the period of increased risk of death due to child-rearing practices (e.g., weaning, infant sleep positioning, etc.), and those from impoverished families were able to supplement insufficient nutrition through employment, if necessary.

A key source of heterogeneity among the surviving teenagers, then, might be acquired frailty, a decreased resistance to stressors resulting from cumulative declines of physiologic systems due to past stress (Marklein *et al.* 2016:210). Though clinical studies suggest that surviving childhood illness can provide an individual greater resistance to specific infectious diseases (even cholera, Cash *et al.* 1974), other research has found that undernutrition and health insults *in utero* and in early infancy can predict adult poor health, an idea known as the Barker hypothesis (Wilson 1999) or DOHaD, the Developmental Origins of Health and Disease (Brickley 2020; Gowland 2015). Blackwell *et al.* (2001) and Finch and Crimmins (2004) found that early-life infections and simple infant diarrhoea led to increased risk of cardiovascular and chronic respiratory conditions as well as cancer and diabetes in later adulthood, while decreased inflammation in early life led to decreased morbidity and mortality in later life (see also Haas 2007). However, these studies focused on old adults and have no direct implications for effects on health in later childhood or early adulthood. Likewise, the Skeletal Frailty Index developed by Marklein *et al.* (2016) for archaeological populations includes degenerative stress markers, which restricts application of the method to comparisons between adult groups.

Studies that focus on sub-adult health outcomes include the work of Walker *et al.* (2007), which suggests that infectious diseases and chronic diarrhoea in the first two years of life can lead to impaired childhood development. These long-term effects may be due to the metabolic costs of illness or to impaired nutrient absorption caused by damage to the intestinal mucosa, which persists well after the diarrhoea episode (McDade 2003:104). A study of formerly anaemic infants in their early adolescence found that children who had experienced severe iron deficiency scored lower on tests of cognitive and motor skills than their peers, though more than 10 years had passed since the deficiency was resolved (Lozoff *et al.* 2000). A longitudinal clinical study by Belsky *et al.* (2015) found that both physical and psychological stress in post-natal development can lead to elevated basal cortisol in childhood, which predicts accelerated reproductive development and poorer physical and mental health at the age of 18 years. However, none of these studies addresses the prevalence of *life-threatening* health issues in older children and adolescents. Jaganath and Mupere (2012) recently explored the mechanisms by which early malnutrition – which is sometime a result of disease or stress – may hamper immune development and leave children at greater risk for infections like tuberculosis. McDade (2003:109-110) found that prenatal undernutrition was associated with impaired antibody response and reduced thymic hormone production in Filipino adolescents, though a higher risk for infectious diseases was not established. Conversely, individuals whose early growth was not hampered by trade-offs in energy allocation (i.e., those who were not frequently ill as children) were found to have stronger immunocompetency in adolescence, perhaps because growth rate serves to regulate future investment in immune function (McDade 2003:114).

While adolescent well-being may be affected by early-life health and nutritional stressors (or lack thereof), it is also subject to the stressors that accompany puberty itself. According to evolutionary life-history theory (Charnov 1991), an individual's finite energy resources must be allocated to three primary life functions: growth, reproduction, and maintenance (McDade 2003). In infancy and childhood, the trade-offs are primarily between growth and maintenance (immune system), whereas in adulthood, growth has ceased, and compromise occurs between investments in reproduction and maintenance. Adolescence is the only life stage during which both growth (pubertal growth spurt) and reproduction (gonadal steroid production) require significant allocations, resulting in a potential increase in infectious disease mortality due to reduced investment in immunity, particularly during the deceleration phase of puberty (McDade 2003:117-118). Heterogeneity of individual allocation strategies could also affect frailty and disease susceptibility.

In the realm of bioarchaeological research, DeWitte and Wood (2008) found that adult and sub-adult individuals with skeletal stress markers formed in childhood – cribra orbitalia, porotic hyperostosis, enamel hypoplasias – as well as periosteal lesions were more likely to succumb to the Black Death. Temple's (2014) study of linear enamel hypoplasia in Late/Final Jomon people, which explored the competing hypotheses of predictive adaptive response (DOHaD) and plasticity/constraint in life histories, found that individuals who invested energy in surviving early-life stress events had increased vulnerability to later stress events due to trade-offs in growth and maintenance investments (Temple 2014, 2018). For the Third Street adolescent population, a careful examination of early-life stress markers explores the possible connections between chronic childhood stress, acquired frailty, and adolescent mortality.

In addition to acquired frailty, another factor to consider is socioeconomic status, which can create living conditions (crowded quarters, poor sanitation, etc.) that increase the risk of disease transmission and death. Unfortunately, this variable cannot be controlled for using archaeological context, as it has been extensively demonstrated that the use of a decorated burial container is not directly related to living socioeconomic status in the U.S. (Bell 1990; Kimmerle *et al.* 2016). However, differences in socioeconomic status may not have had as great an effect on health as expected; a study of census data from the late nineteenth century found relatively little differentiation in child mortality levels based on father's occupation and presumed income (Preston and Haines 1991).

The final source of frailty to be addressed is behaviour. The living population of Dubuque's adolescents likely exhibited a great deal of heterogeneity of risk related to habitual activities, with stark differences particularly noted between males and females (Riney-Kehrburg 2000:121-125). Studies show that modern adolescents experience an elevated risk of death due to external causes compared to other age groups, though it is possible that this proportional mortality is related to a reduced risk of death from disease rather than a greater exposure to physical dangers (Miniño 2010). Perimortem trauma observations and supplementary data from death records are used to explore this issue in Dubuque and other communities investigated in the current project.

4.2. Skeletal Stress and Disease Markers

Four nonspecific skeletal markers of stress and disease were recorded during this project. An overview of causative factors and relevant new research is given below. For greater detail, please see the referenced publications.

4.2.1. LINEAR ENAMEL HYPOPLASIAS

Linear enamel hypoplasias (LEH) have been the focus of innumerable studies of health in past populations (e.g., Armelagos *et al.* 2009; Buzon *et al.* 2005; Cook and Buikstra 1979; Duray 1996; Geber 2014; Goodman *et al.* 1980; Lopez *et al.* 2011; Malville 1997; Ogden 2008; Palubeckait *et al.* 2002; Pitts and Griffin 2012; Temple 2014, 2018). The nature of dental enamel allows for: 1) the survival of dental remains at sites with poor skeletal preservation; 2) the determination of the age at hypoplasia formation; 3) the preservation (through lack of remodelling) of evidence of health insults occurring long before time of death; and 4) the observability of hypoplasias in living populations, which facilitates the exploration of causative factors through longitudinal studies (Goodman and Rose 1990; Goodman *et al.* 1991).

Linear enamel hypolasias are formed when physiological stress disrupts amelogenesis, resulting in bands of enamel that are thinner than portions of enamel laid down during non-stressed periods (Goodman and Rose 1990). The mechanism by which stress disrupts ameloblastic activity is believed to be vasoconstriction, which diverts nutrient-rich blood to the most vital tissues, at the expense of less essential tissue development (Temple 2018:240). Factors of nutritional intake, illness, and genetically-determined weakness or strength of ameloblasts interact in the formation of these defects. Enamel defect research in living populations has provided some conflicting data, with longitudinal studies finding high frequencies of false positives (hypoplasia present, but no documented stress) as well as false negatives (documented stress, but no hypoplasia) (Goodman and Rose 1990:79; Ogden 2008:284). False negatives may be explained to some extent by a failure to identify subtle LEH in portions of teeth with densely-packed perikymata using macroscopic methods; Hassett (2014) recommends the use of scanning electron microscopy in bioarchaeological studies to increase the number of hypoplasias observable. As the current study primarily utilised data collected from skeletal populations that have been reburied, only macroscopic observations were available. In a clinical study particularly relevant to the current project Goodman *et al.* (1991) examined the dentition of Mexican adolescents who had received daily nutritional supplements since birth as compared to a non-supplemented control group. Upper-respiratory and gastrointestinal illnesses were found to be somewhat associated with LEH in this study, but the primary cause was mild to moderate undernutrition during enamel formation. These findings contradict the common assumption that hypoplasia-causing health insults are usually severe or life-threatening.

4.2.2. CRIBRA ORBITALIA AND POROTIC HYPEROSTOSIS

Cribra orbitalia (CO) and porotic hyperostosis (PH) were once believed to have a common cause, the expansion of cranial vault marrow and concomitant widening of the diploë, which results in porous lesions observable on the outer cortex of the cranial vault or roofs of the orbital sockets (Kozlowski and Witas 2012; Lewis 2018a). This process of bone destruction is often attributed to anaemia, which can originate from dietary iron deficiency, parasitic infections (like malaria), or any disorder that prevents normal food intake or absorption from the gastrointestinal system. Genetic conditions which can cause PH, such as thalassemia and haemophilia, are likely to have a marked effect on postcranial elements as well, and thus are distinguishable from nonspecific PH (Kozlowski and Witas 2012:406; Lewis 2018a:194-209). Walker *et al.* (2009) assert that iron deficiency anaemia *cannot* result in the hemopoietic marrow expansion presumed to cause the osseous manifestation of PH, though Oxenham and Cavill (2010) successfully refute this assertion on the basis that ineffective erythropoiesis induced by a lack of available iron causes marrow hyperplasia despite reduced red blood cell production. Both publications, however, point to acquired megaloblastic anaemia due to B_{12} and/or folate deficiencies as a possible common cause for PH. Walker *et al.* (2009) propose a complex relationship between mothers with nutritional deficiencies (especially B_{12}) and offspring who acquire these deficiencies *in utero* and through breastfeeding and insufficient weaning foods, leaving the children with increased susceptibility to infections which may then further affect nutritional status. Another risk factor for anaemia that may have been particularly relevant in the Dubuque area is exposure to lead. Iron deficiency causes hypochromic microcytic anaemia, which increases the body's absorption of lead; the lead, in turn, blocks the uptake of iron, resulting in the kind of ineffective erythropoiesis that may manifest as PH (Hegazy *et al.* 2010).

A recent study by Rivera and Lahr (2017) challenged the assumption that CO and PH result from the same underlying conditions and demonstrated that individuals with CO without associated PH had significantly thinner diploic bone widths than non-cribrotic individuals. The authors conclude that CO may be associated with anaemias that result in diploic bone hypocellularity and hypoplasia – particularly anaemia of chronic disease – rather than the bone marrow hypercellularity and hyperplasia-causing anaemias indicated by PH (Rivera and Lahr 2017).

Both marrow hypertrophy and diploic atrophy can only occur during the period when the cranial vault is still involved in hematopoiesis (i.e., while red marrow is still present). Unless anaemia is already affecting an individual, the conversion of marrow from red to yellow is completed in cranial vault bones by around 12 years, according to some studies (Simonson and Kao 1992:557), or between the ages of 11 and 15 according to more recent data (Brickley 2018). Thus, anaemia that develops after late childhood is unlikely to manifest as CO or PH (Lewis 2018a:194). Though in some cases of severe, chronic anaemia, red-to-yellow conversion may not occur throughout the cranium, this abnormality usually develops in association with thalassemia or sickle cell anaemia (Sebes and Diggs 1979; Simonson and Kao 1992:558). Marrow re-conversion (yellow to red) can occur with increased demand for erythrocyte production, but these changes generally occur in the vertebrae (Brickley 2018). In adolescents, then, cribrotic lesions represent either a previous insult to health (if healing is evident) or an ongoing health issue originating in early childhood.

Though these cranial lesions are often used in stress marker studies, the identification of anaemia-related PH in cranial vault bones is subject to observer error (Ortner 2003, 2012). The ectocranial surface of parietals, for instance, may take on a porous appearance either due to the previously described expansion of the diploë or due to some type of periosteal reaction. In the absence of radiographs, the ray-like arrangement of trabecular bone in anaemia-related PH can only be observed when the cranial vault is fragmented and when the disease process has advanced sufficiently to be seen macroscopically (Grauer 2019:520; Ortner 2003:102-103). When the cranial vault is intact, this type of lesion can be nearly impossible to distinguish from formations of new bone overlying the original ectocranial surface which occur, for instance, in association with scurvy (Ortner 2003:104). Fortunately, skeletal manifestations of scurvy in the orbits are easily distinguished from true CO, as the porous new bone can be seen as elevated above the original cortex in scorbutic lesions (Klaus 2017). The cross-sectional appearance of cranial vault bones affected by rickets is also distinguishable macroscopically from that of anaemia-related PH; though the ectocranial surface exhibits similar porosity, the cross-section reveals the external (and sometimes internal) deposition of subperiosteal cancellous bone (Lewis 2018:198; Ortner 2003:394-395; Ortner 2012:Figure 14.1E).

4.2.3. LABYRINTHINE ENDOCRANIAL LESIONS

Blastic endocranial lesions, also called labyrinthine endocranial lesions (Lillie 2013b:152-155) or serpens endocranial symmetrics (SES) (Hershkowitz *et al.* 2002), are identifiable as the deposition of new bone on the endocranial surface, often with a maze- or web-like appearance (Lewis 2018a:141-145; Ortner 2003:93-97). First recognised by pathologists during dissection, these lesions were found to be associated with epidural haematomas and various meningeal diseases (Koganei 1911 cited in Ortner 2003:93). In archaeological specimens, four expressions of this lesion can be identified: deposited bone with pitted lesions, deposits of white or light-coloured immature bone, “capillary formations” with the appearance of vascular impressions, and “hair-on-end” formations which are labyrinthine and project perpendicularly from the endocranial surface (Lewis 2004:89-90, Figures 2-5). The precise aetiology of these lesions is unknown, and it is likely that any trauma or disease process which causes endocranial inflammation and/or haemorrhage could potentially result in such bony reactions (Lewis 2018a:142-143; Roberts and Buikstra 2019:347). Based on histological studies, Schultz (2001:128-130) concludes that the first two expressions are connected to active bleeding with comparatively little healing before death, while the "hair-on-end" formations represent soft tissue ossification in response to inflammation. Lewis's (2004) study suggests that new fibrous bone deposits observed endocranially on young infants likely represent rapid, normal growth. The other explanation for the prevalence of these lesions in sub-adults is the vascular nature of paediatric bone, which responds more readily to stimuli than adult bone (Lewis 2004:93-94).

Probable causes of endocranial lesions include chronic meningitis (which can be secondary to a number of diseases, including tuberculosis), subdural haematomas, small epidural haematomas, vitamin deficiencies such as scurvy (resulting in slow haemorrhage), anaemia, lead poisoning, and venous drainage disorders (Lewis 2004, 2018:143-145). Hershkovitz *et al.* (2002) and Lovász *et al.* (2010) explored possible connections between endocranial lesions and other evidence of tuberculosis in anatomical and archaeological skeletal collections. Zahareas (2011) studied the occurrence of the lesions in Native American sub-adult skeletons.

4.2.4. PERIOSTEAL NEW BONE DEPOSITION

New bone deposition occurs below the periosteum when the tissue sheath is stimulated either by separation from the cortical bone surface due to trauma or by inflammation from infection or other causes (Mann and Hunt 2005:183-185). Though the term "periostitis" has long been used in palaeopathology to describe observations of these bone deposits (e.g., Lillie and Mack 2013), this designation is discouraged, as the medical term refers specifically to inflammation of the soft tissue (periosteum) rather than the reactive bone (Weston 2012:492-493). While "periostitis" is still sometimes used to refer to new bone formation specifically related to inflammation, "periostosis" is more properly used to denote new bone produced by the periosteum without implying a particular aetiological process. The terms "periosteal reaction" and “periosteal new bone formation/deposition/production” are also preferred in cases where the extent of involvement of the underlying bone is unknown, whereas “sub-periosteal” suggests the bony reaction is external to the original cortex (Roberts 2019:288-289; Weston 2012).

Haemorrhagic periosteal reactions can often be distinguished from those of inflammatory origin based on the involvement of the cortical bone surface. Typically, periosteal new bone formation due to haematoma results in bony changes that are exclusively external to the original bone surface while inflammatory periostosis affects the existing cortical bone as well as causing external bone apposition (Ortner 2003:84-88, Table 6-1). These differences can be difficult to observe macroscopically in archaeologically-recovered specimens, especially when bones are incomplete or when the periostosis was healed or healing at the time of death. However, some cautious classifications can be made. When remodelling or remodelled periosteal bone deposition is observed in a single, focal location, with or without an observable bone callus, it may be hypothesised that the new bone represents a reaction to trauma (with or without bone fracture) or to an ulcer (Ortner 2003:210-215; Weston 2012:504). For the purpose of the current study, it is important to distinguish this type of reaction, and normal sub-adult bone growth, from bone apposition caused by systemic disease processes (syphilis, tuberculosis, typhoid fever, etc.), which is of primary interest here. Trauma-induced periosteal new bone formation can sometimes be related to systemic diseases such as scurvy, in which very minor trauma can result in bleeding and subperiosteal bone formation. However, the presence of multiple lesions sites in scorbutic individuals can distinguish this type of periosteal reaction from that of simple trauma (Ortner 2003:384-394; Lewis 2018a:213-223). For recent discussions of clinical periostitis and periosteal new bone deposition in archaeological populations, see publications by Dawson-Hobbis (2017), Geber (2015), Geber and Murphy (2012), Protopapa *et al.* (2014), and Weston (2012).

4.3. Additional Pathological Observations

In addition to evidence of nonspecific disease and stress events, which may or may not have contributed to a given individual's frailty, this study also investigates two pathological observations which may be more closely linked to cause of death, lesion patterns indicative of tuberculosis and fractures indicating perimortem trauma.

4.3.1. SKELETAL MARKERS OF TUBERCULOSIS

Tuberculosis (TB), most often the result of infection with *Mycobacterium tuberculosis* or *Mycobacterium bovis*, is a popular subject of palaeopathological study, despite the fact that skeletal manifestations of the disease are reported in only 1% to 5% of modern clinical cases (Lewis 2018a:155-164; Ortner 2003:227-263; Roberts 2012:434-457; Roberts and Buikstra 2019:323). Skeletal TB is not the result of primary infection of the bacillus, as initial infections generally lead to a rapid death or recovery. Post-primary TB develops later in life due to reinfection with the bacillus or reactivation of the initial infection. This later manifestation can affect the bones three to five years after the original infection, and is usually spread through haematogenous means (Roberts 2012:434; Roberts *et al.* 1994). Tubercle bacilli prefer to colonise areas of red marrow, likely the reason that the vertebral column is the most commonly reported location for skeletal TB lesions in clinical and autopsy studies (Ortner 2003:228-230).

In palaeopathology, vertebral lesions are more likely than other skeletal manifestations to be identified as tubercular in origin, due to their relatively unique presentation. TB usually affects the bodies of the lower vertebrae. At least two vertebrae are involved, with the destructive focus on the anterior portion of the bodies. Lytic processes lead to cavitation of the vertebral bodies which can eventually result in collapse and sharply-angled kyphosis, changes referred to as Pott's disease. This process can be distinguished from osteomyelitis by the limited amount of perifocal reactive bone formation (Aufderheide and Rodríguez-Martín 1998:123-141; Ortner 2003:230-235; Roberts and Buikstra 2003:89-96). Other common sites of skeletal lesions associated with TB include the hip and knee joints, the sacroiliac articulation, the talocalcaneal joint (especially in older children and adolescents), and the ribs (Ortner 2003:235-253). The cranial vault and mandible and the tubular bones of the hands and feet are more often affected in young children (Lewis 2018a:155-162). Aside from advanced vertebral lesions, none of these manifestations of skeletal TB is pathognomonic, and all are relatively rare, both in living populations and skeletal collections. Differential diagnoses can be difficult to determine, especially in poorly preserved or incomplete skeletons. Recent studies employing biomolecular analysis (aDNA) have identified tuberculosis in skeletons exhibiting both pathognomonic and nonspecific bone lesions (e.g. Müller *et al.* 2014; Murphy *et al.* 2009; Taylor *et al.* 2005; Zink *et al.* 2007), but the application of these methods to large cemetery populations is cost-prohibitive. The clear under-representation of individuals with TB in historic cemeteries dating to documented periods of rampant infection (e.g. Richards *et al.* 2016) presents a problem for understanding the prevalence of the disease in prehistoric populations. Research into more subtle bony evidence of TB has sought to improve this understanding (Lovász *et al.* 2010; Matos and Santos 2006; Roberts *et al.* 1994).

Periosteal bone formation on the pleural surfaces of ribs has been observed on skeletons from both anatomical and archaeological collections, though this manifestation of TB is not mentioned in clinical literature, as it is probably not evident in radiographs. These proliferative lesions are likely related to inflammation caused by contact between the pleura and the rib surfaces in pulmonary TB. As similar inflammation can occur in acute lobar pneumonia and bronchiectasis, the lesions cannot be considered pathognomonic of TB (Roberts *et al.* 1994). However, three studies of anatomical collections have found a correlation between these lesions and a medical history of TB, with up to 90% of documented TB victims exhibiting proliferative bone on their ribs (Roberts *et al.* 1994; Santos and Roberts 2001; Matos and Santos 2006). Diagnostic criteria proposed by Matos and Santos (2006) to distinguish TB lesions from evidence of other pulmonary disease include bilateral presentation, involvement of the third through seventh ribs, concentration on the vertebral end of the rib, and lamellar rather than woven bone deposition. In a study of 77 bone samples from Britain and Europe, Müller *et al.* (2014) confirmed the presence of *M. tuberculosis* complex DNA in ribs exhibiting this new bone formation.

To these diagnostic criteria, Lovász *et al.* (2010) add two more skeletal observations – superficial pitting of the ventral surfaces of vertebral bodies and labyrinthine or granular endocranial impressions – as a proposed suite of markers of early-stage tubercular infection. In a study of mycobacterial DNA, Zink *et al.* (2007) established the presence of *M. tuberculosis* in the remains of several individuals (11/42) from the late medieval Bácsalmás-Óalmás site (Hungary) exhibiting this group of lesions. In her study of sub-adults from the Romano-British Poundbury Camp, Lewis (2011) found that tubercular lytic lesions of the spine were observed only in individuals age 12 and older, with the disease manifesting differently in younger sub-adult skeletons due to the extensive availability of red marrow sites and vascularisation at the growth plates. New bone formation on the pleural surface of ribs, widespread periosteal bone formation on long bones, dactylitis (with involucrum), and osteomyelitis of the mandible were considered possible indicators of tubercular infection, though only when found in combination with each other or with pathognomonic markers.

Application of these recently developed criteria has the potential to identify many more historic and prehistoric cases of TB than have so far been recognised in skeletal materials, particularly in the remains of sub-adults. A study of clinical records from the Stannington children's sanatorium (Bernard 2003; Roberts and Bernard 2015), spanning the pre-antibiotic and early antibiotic eras (1936-1954), presented two findings relevant to the current study. Peak admission age for the sanatorium, which accepted children 1 to 16 years old, was 13 years for both males and females, which was also the peak age for female deaths from TB in the institution. This finding supports the theory that resistance to TB is lower during puberty, when hormonal changes result in altered pathogenesis; essentially, the immune system switches from a containment strategy to a destructive response, which ultimately creates a more favourable environment for the bacilli (Marais *et al.* 2005). Additionally, Bernard's (2003) study of the Stannington children found that 12% of admitted patients presented with skeletal TB. This high percentage, which is greater than that identified in clinical studies, may be related to the age of the study population or may be due to the non-random sample, as children with obvious symptoms like deformities and mobility problems might be more often admitted to institutions (Bernard 2003; Roberts and Bernard 2015). In any case, an examination of sub-adult skeletons which also includes bony manifestations not recorded in clinical settings (e.g., periosteal new bone formation on the ribs) has the potential to identify somewhere between 12% and 90% of individuals affected by TB.

4.3.2. PERIMORTEM TRAUMA

In poorly preserved bones, distinguishing between perimortem trauma and taphonomic damage can be difficult (Saul and Saul 2002). Even when bone damage is clearly identifiable as perimortem, through observations of oblique fracture angle and uniform bone coloration, there is still the problem of ambiguous timing; in dry bone there is no way to distinguish between trauma that occurred shortly before death (with death occurring before visible osseous response), at the time of death, or shortly after death, due to burial practices, medical use of the corpse, or accidental events (Walker 2001). For the purpose of the current project, any skeletal trauma that resulted in death is considered perimortem, even if the individual survived a few days after injury. As the skeletal collections used in this study originated primarily from formal, coffined burials, the possibility that trauma occurred in the early post-mortem period is less of a concern; cut marks from anatomization, which are prevalent in the collection from the Milwaukee County Poor Farm Cemetery, are easily distinguished from injury-related bone damage. Determination of the manner of death in archaeologically-recovered skeletal remains is not always possible, but recent publications which address injury patterns related to accidents and violence include those by Dougherty (2011), Crist (2006), Liston and Baker (1996); Martin (2010), and Novak (2006).

4.4. Osteological Adolescence and Puberty

In *Standards for Data Collection from Human Skeletal Remains*, the age range for skeletally-observable adolescence is given as 12 to 20 years (Buikstra and Ubelaker 1994:9). This period includes the eruption of second molars and fusion of the major epiphyses of the long bones for both males and females, making this stage relatively easy to identify even in partial and poorly preserved skeletons (Schaefer *et al.* 2009). However, this aging scheme is not universally followed, with nomenclature and age ranges varying between professionals in different fields (e.g., medicine, behavioural biology) working in different regions. In continental Europe, some skeletal biologists define individuals between the ages of 14 and 22 as “juvenile,” a classification which Cunningham *et al.* (2016:474) dispute, as this scheme depends on second molar emergence and spheno-occipital synchondrosis closure times that are later than the observed average. In a survey of 200 articles from three anthropological journals, Falys and Lewis (2011:708) found that some authors placed the onset of adulthood as early as 14 years and while others set the cut-off as late as 25 years. Though Lewis *et al.* (2016) used a broad age range of 10 to 25 years for adolescence, they noted that some of the oldest individuals in their sample died without full skeletal fusion, a finding that highlights the difficulty of defining biological adolescence.

Shapland and Lewis (2013, 2014) argue that chronological age ranges may not be particularly applicable to past populations, as birth dates were not systematically recorded before the modern era, and “age” was likely assessed by physical appearance and the passing of milestones such as first menstruation and the appearance of facial hair. Their study identified six developments observable in dry bone that correspond with stages of puberty recognised in living adolescents, including mineralisation of the mandibular canine root; ossification and fusion of the epiphyses of the hamate, distal hand phalanges, iliac crest, and distal radius; and maturation of the cervical vertebrae. Pertinent to the current study, the fusion of the distal phalanges and the presence of an ossified but unfused iliac crest both indicate that the peak height velocity phase (PHV), the period of fastest growth, is finished, and that the individual has entered the deceleration phase. The deceleration phase coincides with menarche for girls and the completed voice change for boys, developments that often have social relevance. The application of this pubertal stage analysis to adolescents excavated from two medieval to post-medieval cemeteries in England identified the average age of menarche as three years later than in modern populations but somewhat younger than that of mid-nineteenth century Europeans, variations which may be related to living conditions and nutritional status (Shapland and Lewis 2013:308-309, 2014:151).

The skeletal materials from the Third Street Cemetery and selected comparative burial grounds were originally analysed and assigned to age classes using the guidelines in *Standards* (Buikstra and Ubelaker 1994), with individuals aged 12 to

20 considered adolescent. Where possible, adolescent skeletons used in this study were re-evaluated for pubertal stage using the techniques developed by Shapland and Lewis (2013). Age classification was further refined with regards to nineteenth-century standards of social adolescence (see Chapter 6).

4.5. Adolescent Health and Mortality

4.5.1. BIOARCHAEOLOGICAL STUDIES

Relatively few bioarchaeological studies have focused on the adolescent segments of past populations. The lack of research may be due to the fact that adolescents constitute such a small portion of most cemetery populations (Lewis 2007:186; Lewis *et al.* 2016a:49). The largest studied sample of adolescents (12 to 17 years) from a single site in the United Kingdom includes 544 individuals, which represents 10.1% of the 5,387 analysed skeletons from St. Mary's Spital, a larger proportion than is generally found in excavated cemeteries (Connell *et al.* 2012:28; Lewis *et al.* 2016a:50). That same percentage in a smaller cemetery translates to very few individuals indeed. Additionally, some researchers believe that the life stage of social adolescence did not exist or had little importance prior to the modern era and in non-Western cultures, thus rendering a study of prehistoric teenagers, for instance, socioculturally meaningless (Ariés 1962:29-30; Demos and Demos 1969; Dixon 1992:101-2; Heywood 2010; Hanawalt 1992:341-342; Kett 1971; Mintz 2004:3,35-37). Though it may be true that the transition from childhood to adulthood in many past cultures was a swift rather than extended affair, the physiological changes which occur during the pubertal period place adolescents in a separate biological category even if not socially recognised. The implications of these physiological differences have yet to be fully explored, but the increased need for resources devoted to pubertal growth and the effects of hormones on the immune system both have the potential to affect disease susceptibility (Lewis 2018a:6).

Until recent bioarchaeological research, studies of adolescence tended to originate from the discipline of physical anthropology, focusing exclusively on methods for determining age and sex from skeletal remains (e.g., Cardosa 2008a, 2008b; Hewitt and Acheson 1961a, 1961b; Rogers 2009; Shapland and Lewis 2013, 2014). In

2010, Djurić *et al.* published a palaeopathological study of 81 adolescents from a medieval cemetery in Serbia, looking at both infectious disease and trauma rates. A comparison with 22 other medieval cemeteries in Serbia found that the average proportion of adolescent burials was 8.6%.

Recent work by Lewis (2013, 2016; Lewis *et al.* 2016a, 2016b; Shapland *et al.* 2015) investigated the lives of adolescents in medieval England, finding evidence of physically demanding labour and disproportionate exposure to respiratory diseases among urban females who may have been apprentices or domestic servants. A study of individuals aged 10 to 25 years old from three urban medieval cemeteries found evidence of extended puberty, particularly in samples from London, where children and adolescents presumably experienced greater physiological and psychological stress due to overcrowding, poor diet, intensive physical labour, disease, and poor sanitation (Lewis *et al.* 2016a). A follow-up study explored the relationship between chronic conditions and delays in skeletal maturation (Lewis *et al.* 2016b). Two other recent projects (Doe *et al.* 2017; Henderson and Padez 2017) applied the same pubertal stage analysis to individuals excavated from a medieval Hispano-Muslim burial site in Murcia, Spain, and to adolescents in the identified skeletal collection in Coimbra, Portugal. Using pubertal stage analysis to group adolescents from Romano-British sites, McGovern (2019) conducted a study of the female life course, focusing on the shape and development of the pelvis and the implications for childbirth outcomes.

Some bioarchaeological studies of sub-adults also include individuals in the adolescent age bracket. An investigation into osteologically observable physeal fractures on sub-adult remains found more of these injuries on 12- to 17-year-olds than children of younger age groups (Verlinden and Lewis 2015). One possible reason for the observed age pattern is increased exposure to hazards as adolescents entered the workforce. In a study of one rural and two urban cemetery samples, Niedbała (2017) explored the growth rates and health status of children and adolescents in medieval and post-medieval Poland, finding that rural sub-adults had the shortest stature, perhaps due to historically documented crop failures. A palaeopathology study of sub-adults in Britain (AD 1000-1700) that examined the detrimental effects of the Reformation – and the associated loss of monastic hospitals and church-led poverty management – on the health of children, found that individuals 12 to 16 years old exhibited adult levels of trauma in the fourteenth to sixteenth centuries, with a dramatic drop in the Post-Reformation period (Penny-Mason and Gowland 2014).

4.5.2. MODERN ADOLESCENT MORTALITY

Adolescence and adolescent mortality are frequently subjects of research in disciplines outside of bioarchaeology, including the fields of public health, medicine, psychology, and sociology (e.g., Batalis and Collins 2005; Bordere 2008; Gissler *et al.* 2009; Makinson 1985; Mare 1982; Miniño 2010; Shields 2006). These studies are imbued with a sense of urgency quite different from archaeological musings, given the disproportionately high rates of modern American adolescent deaths due to external causes such as accidents, homicide, suicide, and drug overdose (Miniño 2010; Kochanek *et al.* 2016). Much of the literature wrestles with the topic of prevention, since external causes of death are, by definition, largely avoidable (Catalano *et al.* 2012; DiClemente *et al.* 2013; Thomas 2010).

Adolescent deaths comprise a small fraction of losses in the United States each year, with 12- to 19-year-olds making up only 0.68% of reported deaths from 1999-2006 (Miniño 2010). Male teenagers are more likely to die than females at every year of age. The five leading causes of death for teenagers in these study years were accidents (48% of adolescent deaths), homicide (13%), suicide (11%), cancer (6%) and heart disease (3%). This differs significantly from the five leading causes for the American population as a whole, which are heart disease, cancer, lower respiratory disease, accidents, and stroke (Kochanek *et al.* 2016:1). Though adolescents (10 to 19 years) made up less than 0.5% of the deaths recorded in 2014, the number of deaths recorded for the 15 to 19 age bracket (9,586) was two or three times greater than the number recorded for all younger 5-year brackets, with the exception of infants under one year (Kochanek *et al.* 2016:26).

A forensic study in South Carolina sought to outline the specific victimology of adolescent decedents (Batalis and Collins 2005). Out of 497 cases reviewed, 76% of the adolescents were male and 56% were African American. Another forensic review specifically focused on adolescent suicide cases from 1993 to 2002 found that most victims were White and male (Shields *et al.* 2006). Youth suicides rose from constituting 5.8% of all American suicides in 1950 to representing 19.5% of all suicides by 1980. In 2014, 4,171 individuals in the 15 to 24 age group died as a result of homicide, a higher number than any other age group, accounting for 26.3% of all homicides (Kochanek *et al.* 2016:44).

A study conducted in Nordic countries using data from 1981 to 2000 found that even when violence is not as great a factor, around 40% of child and adolescent deaths are due to external causes and that males are around 30% more likely to die than females of the same age (Gissler *et al.* 2009). A targeted analysis of deaths caused by diseases and medical conditions found males still at greater risk of mortality, particularly in the 15- to 19-year bracket. Yet females experience risks that do not affect their male counterparts. Multiple studies have found that teenagers have a higher risk of maternal death (e.g., Berg *et al.* 2003; Conde-Agudelo *et al.* 2005; Makinson 1985), with adolescents under 16 years four times more likely to die from pregnancy-related causes than women in their twenties in Latin America (Conde-Agudelo *et al.* 2005:347). Additionally, adolescent girls who deprive themselves of nutrition during pregnancy in order to prevent unfashionable weight gain place themselves at risk for anaemia and their unborn children at risk for future health issues such as obesity, cardiovascular disease and Type 2 diabetes (Wojtyła 2011). If the unborn child is female, this risk is also passed to the adolescent's grandchildren, through epigenetic effects on the ova developing in the foetus (Gowland 2015:534).

"Adolescents today are increasingly at risk for adverse health outcomes, even death, that are not primarily biomedical in origin. Whereas infections previously accounted for a disproportionate share of disease and mortality, at present the overwhelming toll of adolescent morbidity and mortality is the result of life-style practices (DiClemente *et al.* 2013)." However, despite the hand-wringing of psychologists, the changes in cause-of-death profiles for American adolescents occurring between the nineteenth and the mid-twentieth centuries may not be purely the result of an increasingly careless and violent youth population, but partially due to the reduction in deaths from infectious diseases with the introduction of antibiotics in the 1940s and a sharp decline in tuberculosis deaths after 1945 (Armstrong *et al.* 1999).

4.6. Summary

The health and mortality of adolescents has only recently become a subject of interest in bioarchaeological research and has previously been neglected in American cemetery studies. The current project builds on research in the UK and Europe concerning adolescent rates of disease and trauma. The skeletal markers of stress, chronic illness, and injury considered in this study – LEH, CO/PH, labyrinthine endocranial lesions, nonfocal periosteal bone formation, tubercular lesions, and perimortem trauma – were selected based on their observability at all ages and their potential to provide information about both past and perimortem health issues. Though in most cases disease markers cannot be linked directly to cause of death in specific individuals, their prevalence rates within different age groups can illustrate patterns of morbidity in the non-survivor populations. Keeping in mind the issues of the osteological paradox, two primary sources of frailty among adolescents bear consideration, acquired frailty (vulnerability due to past health stress) and heterogeneity of risk related to habitual activities, which continues to gravely impact adolescent mortality in America today.

Chapter 5

Materials and Methods

5.1. Introduction

The human remains and artefacts from the majority of the burial grounds examined in this study were re-interred prior to the beginning of the current research project in 2017, including those of the primary study population from the Third Street Cemetery. Both the osteological and material culture portions of this thesis relied almost entirely on standard data previously collected for the sole purpose of preserving information from cemetery removal projects (i.e., without particular research questions in mind). The author was unable to conduct additional analyses using the physical bones or artefacts from these cemeteries (with two exceptions detailed in Sections 5.4.1 and 5.4.2), though photographs of materials were utilised for some re-analysis and clarifications.

The author participated in the excavation of the Third Street Cemetery, as well as the original analysis of human remains and artefacts from the site. However, the work was unrelated to this doctoral research. The original Third Street Cemetery project was conducted by the University of Iowa Office of the State Archaeologist (OSA) as a contract archaeology undertaking from 2007 to 2013. Osteological analyses were performed primarily by Robin Lillie, Kourtney Donahue, Nicole Geske, and the author, with the author examining – in whole or in part – approximately half of the skeletal remains. The results of this project were published in a publicly available report (Lillie and Mack 2013). This report also includes data from four other burials in the same cemetery, which were excavated and analysed by OSA staff in 1994. Following the discussion of materials in this chapter, the explanation of methodology is divided into two parts. First, the data collection protocols used by the Burials Program of the OSA for the original project are described (Section 5.3). Subsequently, the data collection strategies employed in the current study are discussed.

5.2. Materials

For the current research project, historical, skeletal, and artefactual data relating to nineteenth-century Dubuque and the excavated Third Street Cemetery were collected from primary historical sources and from materials produced by the original Third Street project. Data from the comparative cemetery sample, which includes 10 nineteenth-century burial grounds from across the U.S., were gathered primarily from published excavation reports. A combined total of 5,045 burials were studied in this investigation, including those of 207 individuals determined to be likely osteological adolescents (12 to 20 years).

5.2.1. DUBUQUE AND THE THIRD STREET CEMETERY

Primary Historical Sources, Dubuque

Official and unofficial population, marriage, and death records of varying levels of reliability were consulted in order to 1) establish the existence, and age range, of social adolescence in the community at the centre of this research; and 2) elucidate community patterns of mortality related to disease, accidents, and violence. A list of utilised sources is provided below, along with critiques of the relative accuracy of the individual sources.

The United States Federal Census enumerates the residents of Iowa, and the rest of the country, every ten years. Records from 1850, 1860, 1870, and, to some extent, 1880 were consulted for this study. The 1840 Census was eliminated, as it provides only numbers of individuals per household, divided by age ranges, rather than names and exact ages. During the selected four enumerations, the U.S. Census Bureau also collected data for the Mortality Schedules. These schedules list all the members of each household who died in the 12 months leading up to the census, along with details such as age and cause of death. Scans of these original documents were accessed through Ancestry.com.

Additional records were available in the form of territorial and state censuses. The 1836 Wisconsin Territorial Census included Dubuque County. After statehood, Iowa undertook state-wide enumerations in 1854 and 1856. The 1836 and 1854 documents are of limited use, as they do not provide names and exact ages.

Published compilations of Iowa State Census returns were used for tabulated data concerning the population at large (Executive Council 1882; Grimes *et al.* 1857; Hull 1883).

Of course, census data varies from precise to extremely unreliable. Heads of households reporting the ages of their offspring sometimes made mistakes or intentionally misled census takers, as can be seen from entries for individuals whose ages change by odd numbers between 10-year enumerations. Additionally, some information may have been gathered from neighbours if a family was not home when the census taker called. Many deaths were either forgotten or simply not reported for the Mortality Schedules, as is evidenced from individuals who appear in other death records but not the official schedules. Some census takers were meticulous, while others were not as diligent. Many pages of records for Dubuque contain no information in the far-right columns concerning school attendance and recent marriage. The 1870 Mortality Schedule for Dubuque is heavily edited in a hand different from that of the original recorder, with dozens of causes of death altered. The basis for these corrections is unknown, but they underscore the limitations of self-reporting, especially at a time when disease processes were poorly understood even by medical practitioners.

The other government records consulted for this study were Dubuque County marriage licenses and returns. Since sworn witnesses were required to corroborate the identities and ages of the brides and grooms, these documents are considered reliable. Unfortunately, ages were not commonly included in the licenses, and were more likely to be recorded when the bride was under-aged and required parental consent (Tom Schlarman, personal communication 2017).

The burial records from Dubuque's nondenominational City Cemetery (1855-1875) are not truly municipal records. They are derived from monthly reports submitted to the city council by the cemetery sexton, Henry Kroll, in accordance with an ordinance passed after the sexton was suspected of padding his bills for public burial (Phoenix Project 2002). The records are incomplete, as not all the reports have survived, and it is unknown what source the sexton used for cause of death. Over 200 entries list no cause of death at all, not even "unknown," suggesting that the sexton sometimes forgot to collect this information. However, 2,752 entries provide age, date of death, and cause of death.

The Burial Register of St. Raphael's Cathedral (and its short-comings) has already been discussed in Section 3.5. Volume I of this register covers the years 1839 to 1856. A handwritten note in the back of the register, dated 1930, states, "The death records between July 1856 and November 1900 have been missing for many years. I do not know that any such records are in existence (Phoenix Project 2005)."

Obituaries, funeral announcements, and post-mortem biographical sketches comprise the final category of primary sources. These appeared in two rival newspapers which operated for most of the active period of the Third Street Cemetery, the *Dubuque Daily Times* and the *Dubuque Herald* (which underwent numerous name changes). Though these items seem accurate when checked against other sources, they suffer some deficiencies. Fewer issues of newspapers published prior to 1860 have survived. Cause of death is not often included in newspaper items, other than articles describing accidents and acts of violence. Most of the obituaries and funeral announcements concern members of prominent families, leaving the burial of the poor at Third Street unrecorded.

Excavated Materials, Third Street Cemetery

The osteological and artefactual data used for the current project (2017-2020) were collected from files generated by the original Third Street Cemetery projects (1994 and 2007-2013). These files included field notes, GIS data and maps, field photographs, burial inventories, handwritten osteological analysis forms, an osteological database, photographs of pathological features, artefact analysis spreadsheets, and artefact photographs and drawings. All of these materials are archived at the University of Iowa Office of the State Archaeologist under the Burial Project #s 787 and 2147; the site number is 13DB476.

A total of 939 graves were excavated in the Third Street Cemetery, and disturbed human remains representing a minimum of seven adults and eight sub-adults were also recovered. The sample of 883 individuals/grave features used for the current study includes only those that could be assigned to a general age class (defined in the methods section below). Numerous previous episodes of disturbance in the cemetery (including intentional disinterment) and poor bone preservation left many skeletons incomplete. Though some burials exhibited excellent preservation (particularly those within the sand lens), bone preservation at the site overall was fair to poor, with substantial post-mortem erosion of the cortical surfaces and often complete loss of element segments with a high proportion of trabecular bone (vertebral bodies, long epiphyses, etc.). Young sub-adult skeletons exhibited the worst preservation, with many represented only by the petrous portions of the temporals and tooth crowns or enamel fragments (Lillie 2013b:136). The compact nature of the skeletal materials when prepared for reburial illustrates the generally incomplete preservation; nearly all human remains and personal items recovered during the excavation were re-interred in just three standard concrete burial vaults, with interior dimensions of approximately 200 cm by 75 cm by 65 cm.

Only 13 of the individuals excavated from the Third Street Cemetery could be identified or tentatively identified based on coffin lid plate inscriptions, burial groupings, and demographic data (Mack 2013f:255-278).

5.2.2. COMPARATIVE DATA SOURCES

Comparative data for this study were mined primarily from technical reports and other publications resulting from compliance archaeological projects involving the excavation of historic-period American cemeteries. The ten chosen burial grounds represent multiple regions of the United States – the Midwest, East, South, Southwest, and West Coast (Figure 5.1) – each with a distinct history and climate. Catholic, Protestant, and public cemeteries are included, as well as an institutional cemetery which provided burial at the expense of the county. Euroamericans, African Americans, Hispanics, and multi-ethnic populations are represented in the sample. A description of each of the comparative cemeteries is provided below, along with the dates of use (Table 5.1, Figure 5.2).

The Second Catholic Graveyard, St. Louis, Missouri

This urban, Catholic burial ground was used from 1824 until the 1850s, though some of the interred coffins may have been moved from the earlier Catholic cemetery near St. Louis Cathedral. The group utilising the graveyard was composed primarily of French, German, Irish, and African-American parishioners. Later the site of a gas station, the cemetery was rediscovered during the construction of a new police station. In 1991, 121 graves were excavated by the Archaeological Survey of the University of Missouri-St. Louis. Information about this project was gathered from the published report (Harl *et al.* 1996), with additional dental data provided by the University of Missouri-St. Louis. Seventy-nine excavated individuals were included in the current research (three adolescents).

Grafton Cemetery, Grafton, Illinois

Used from ca. 1834 to 1873, this public burial ground served the small urban centre of Grafton, located near the confluence of the Illinois and Mississippi Rivers. The population buried in the cemetery included migrants from the eastern and southern United States, as well as recent immigrants from Germany and Ireland. After the cemetery's abandonment, the land was used as an agricultural field. The graveyard was rediscovered during the massive project to relocate the entire town of Grafton out of the flood zone. In 1994, 252 graves – most with extremely poor bone preservation – were excavated by the Center for American Archaeology, including 18 containing adolescents (Buikstra *et al.* 2000). Data for the current project were gathered from the published excavation report (Buikstra *et al.* 2000), handwritten field notes, handwritten analysis forms, and examination of artefacts.

Milwaukee County Poor Farm Cemetery, Wauwatosa, Wisconsin

This urban institutional cemetery, also known as the Milwaukee County Institution Grounds Cemetery #2, was used from 1882 to 1925 for the interment of individuals who died in the Milwaukee County Institutions – the Poor Farm, isolation hospital, Asylum for the Chronically Insane, and the Home for Dependent Children – as well as unidentified individuals from the coroner's office and Milwaukee County residents unable to afford burial fees. Records indicate the interred included American-born individuals, along with many from Germany, Austria, Ireland, Poland, and other countries. Expansion of the Milwaukee Regional Medical Center in the late twentieth century disturbed the forgotten burial ground. In 1991 and 1992, 1,649 graves were excavated by the Great Lakes Archaeological Research Center. Further expansion of Froedtert Hospital led to the excavation of an additional 632 graves in 2013 (Dougherty 2011; Milligan 2010; Richards 1997; Richards *et al.* 2016).

The skeletal collection from the Milwaukee County Poor Farm Cemetery (MCPFC) is one of the few large historic cemetery assemblages that has not been reburied. Though data for most of the 612 individuals included in the current study were gleaned from the published excavation report (Richards *et al.* 2016) and handwritten analysis notes, the author was able to examine the skeletal remains of the 13 adolescents at the laboratory of the University of Wisconsin-Milwaukee.

Eastern United States

Voegtly Cemetery, Pittsburgh, Pennsylvania

Voegtly Cemetery was an urban burial ground used from 1833 to 1861 by the Swiss-German congregation of Voegtly Evangelical Lutheran Church. When a new cemetery for the church was established, the existence of the graves was forgotten, until highway construction disturbed coffins in 1987. GAI Consultants, Inc. excavated 724 burials that year, and skeletal analysis was conducted by the Smithsonian Institution. Reports on the excavation and analysis (Beynon 1989a, b; Dzodin and Luff 1989; Ubelaker and Jones 2003) provided data concerning the 686 individuals (19 adolescents) included in the current study.

South

Wells Cemetery, Ooltewah, Tennessee

Wells Cemetery likely began as a family burial ground that later served the larger, Euroamerican, primarily Protestant community in a rural part of James County (now Hamilton County), Tennessee. Though not forgotten, the cemetery property was sold and later used as a livestock pen, despite the fact that headstones were still present. In 2009 and 2010, the graves were relocated to another portion of the property to make way for commercial construction. TRC Environmental Corporation excavated all 362 graves from the cemetery. Based on inscriptions on the surviving grave markers, the burials date from 1838 to 1876 (McKee 2012). Spreadsheets and photographs provided by the excavator, along with the report (McKee 2012), furnished details about the 358 burials incorporated in the current project, including 13 containing adolescents.

Freedman's Cemetery, Dallas, Texas

This urban African-American cemetery was used from around 1869 to 1907. In the early twentieth century, all above-ground evidence of the graveyard was removed during road construction projects. Approximately one quarter of the cemetery was excavated between 1990 and 1994 by the Texas Department of Transportation. In all 1,157 individuals were excavated during this project. Data concerning the 1,131 individuals (56 adolescents) included in the current project was taken from the published reports (Condon *et al.* 1998; Davidson 1999, 2004a; Peter *et al.* 2000) and from spreadsheets provided by James Davidson.

Avondale Burial Place, Bibb County, Georgia

From 1869 to 1935, the African-American community of rural Bibb County, which was primarily Baptist and African Methodist Episcopal, used the Avondale Burial Place for interment of their dead. The abandoned cemetery was unmarked when it was discovered in the right of way of a road slated for improvement. In 2010, New South Associates, Inc. excavated 101 graves on the property. The published excavation report (Matternes *et al.* 2012a, b) provided data for the 100 burials (three with adolescents) included in the current project database.

Southwest

Campo Santo, San Antonio, Texas

The Campo Santo burial ground was associated with San Fernando Catholic Church and was used by the majority Spanish, Mexican, and Native American community from 1808 to 1860. After the pioneer-era cemetery was closed, a hospital was built over the site. In 2015, hospital expansion disturbed several graves. A team from the Center for Archaeological Research and the Department of History at the University of Texas-San Antonio was scheduled to excavate a portion of the cemetery (ca. 70 graves) in 2018, but this fieldwork was delayed by legal proceedings. However, parish records provide documentation of the interments of 2,925 individuals buried in the cemetery (Leal 1975; Mauldin *et al.* 2018).

Alameda-Stone Cemetery, Tucson, Arizona

The Alameda-Stone Cemetery was a public burial ground used by the majority Hispanic Catholic community of Tucson from some time around the early 1860s until 1875. Euroamericans, Native Americans, and African Americans were also buried in the cemetery. Additionally, a small American military section was open from 1862 to 1881. After the urban cemetery closed, the land was sold for residential development in the late nineteenth century. Later, approximately 80 to 120 burials were removed during the construction of the local newspaper's headquarters in 1953. In 2006, in advance of the construction of a large court building, the remainder of the cemetery was excavated by Statistical Research, Inc. A total of 1,339 individuals were recovered during the excavation (Heilen and Gray 2010a, b; Heilen *et al.* 2010; Heilen 2012). Of these, 927 individuals were incorporated into the current research project, including 38 adolescents. Data from the excavation and analysis were provided by the published reports (Heilen and Gray 2010a, b; Heilen *et al.* 2010), with additional information furnished in spreadsheets by one of the excavators.

West Coast

Dove Cemetery, Atascadero, California

This small, rural cemetery was used by Euroamericans and Hispanic Americans in Dove and Santa Margarita, California, from the 1870s to the 1890s. In 2004, after the abandoned cemetery property was sold for residential and commercial development, Statistical Research, Inc. excavated the site, recovering the remains of 17 individuals, including one adolescent. Data from the excavation publication (Sewell and Stanton 2008) were used for the current project.

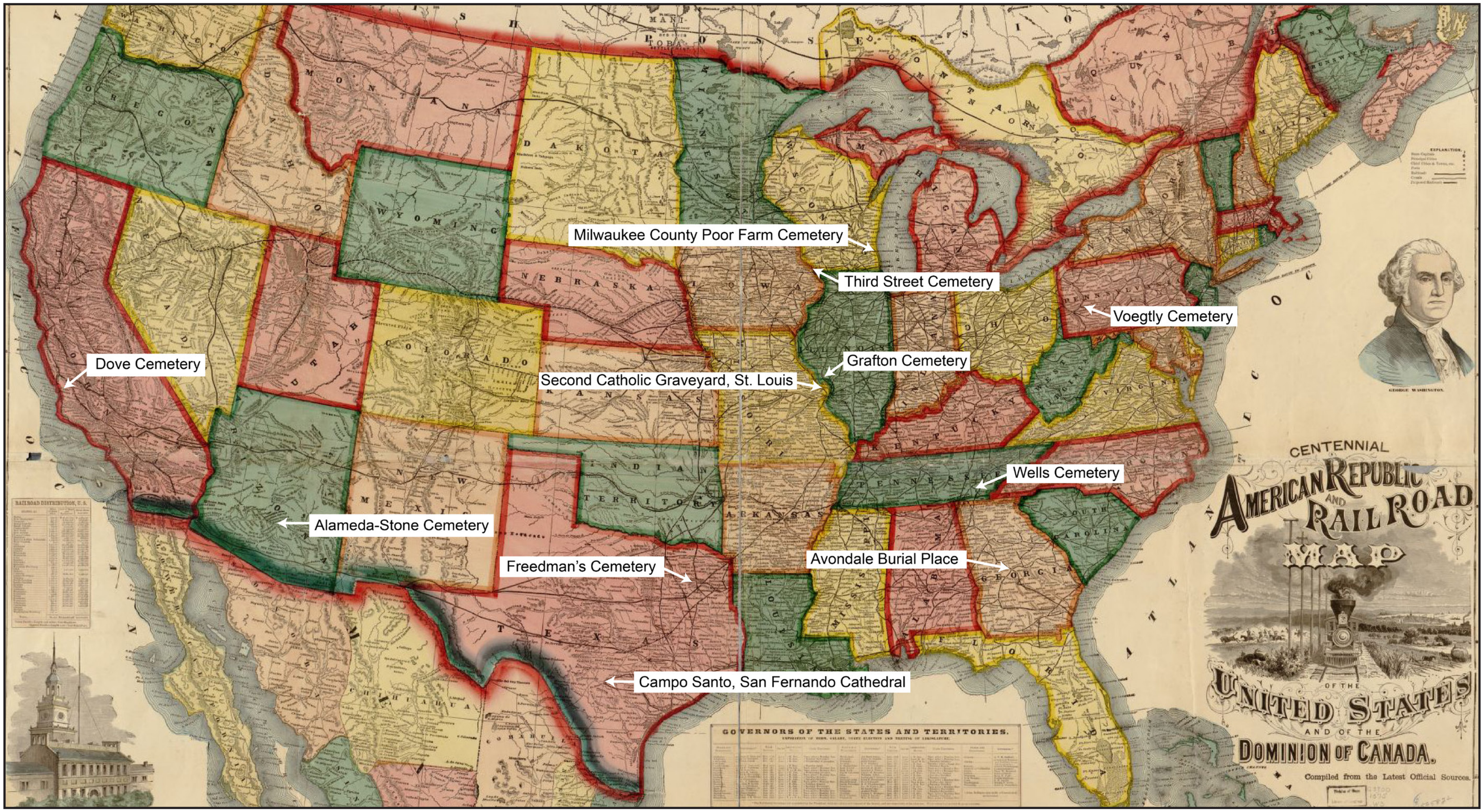

Figure 5.1. Map showing the locations of the Third Street Cemetery and the ten comparative burial grounds. Base map: Centennial American Republic and Railroad Map of the United States and of the Dominion of Canada, Gaylord Watson, 1875 (public domain, Library of Congress).

Table 5.1. List of cemeteries examined in this study, arranged in chronological order and including date range, region, settlement type, cultural background, religious affiliation, and climate (Köeppen classification information taken from weatherbase.com).

Cemetery	Period	Region	Settlement type	Cultural background	Religious affiliation	Climate
Third Street Cemetery	1833-1880	Midwest	Pioneer to urban	Euroamerican	Catholic	Hot summer continental
Campo Santo de San Fernando	1808-1860	Southwest	Colonial/Pioneer	Spanish, Mexican, Native American	Catholic	Humid subtropical
Second Catholic Graveyard	1824-1850s	Midwest	Urban	Euroamerican	Catholic	Humid subtropical
Voegtly Cemetery	1833-1861	East	Urban	Euroamerican	Lutheran	Warm summer continental
Grafton Cemetery	1834-1873	Midwest	Urban	Euroamerican	Nondenominational	Humid subtropical
Wells Cemetery	1838-1876	South	Rural	Euroamerican	Nondenominational, Protestant	Humid subtropical
Alameda-Stone Cemetery	1860s-1875	Southwest	Pioneer to urban	Mexican, Euroamerican, Native American, African American	Nondenominational, majority Catholic	Mid-latitude steppe and desert (hot semi-arid)
Freedman Cemetery	1869-1907	South	Urban	African American	Nondenominational	Humid subtropical
Avondale Cemetery	1869-1935	South	Rural	African American	Nondenominational, Protestant	Humid subtropical
Dove Cemetery	1870s-1890s	West Coast	Rural	Mexican, Euroamerican	Nondenominational, majority Catholic	Dry-summer subtropical (Mediterranean)
Milwaukee County Poor Farm Cemetery	1882-1925	Midwest	Urban	Euroamerican	Nondenominational	Warm summer continental

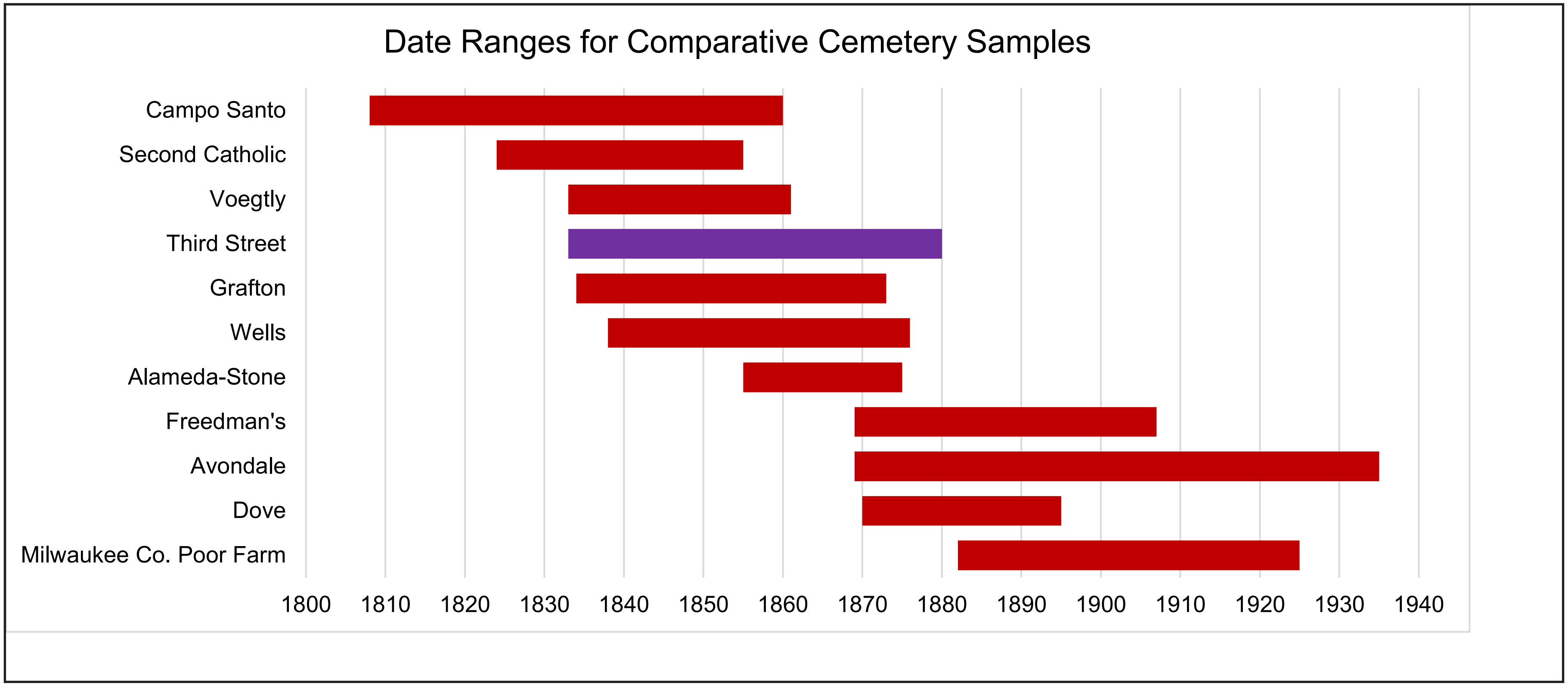

Figure 5.2. Graph showing the date ranges of the comparative cemeteries in relation to the Third Street Cemetery (in purple).

5.3. Original Third Street Cemetery Project Methods

5.3.1. FIELD METHODS

Fieldwork at the Third Street Cemetery was conducted by the OSA over five field seasons in 1994, 2007, 2008, 2010, and 2011. The work in 1994 entailed only the salvage excavation of four partially disturbed graves. The remainder of the project was undertaken in stretches of several months, as allowed by Iowa weather. As the burials were unmarked, heavy machinery was used to strip away the topsoil and layers of levelling fill until dark soil stains believed to be grave shafts appeared. Each potential grave shaft stain (or cluster of human remains) was assigned a number. After further investigation with hand tools, many of these stains were found not to be graves. Burial numbers were not re-used, which is why numbers appear to be missing in the sequence. When coffins were stacked within a grave shaft (intentionally or unintentionally), all individuals retained the same burial number, with the uppermost coffin designated “A,” the next “B,” etc. When disturbed remains of other individuals were found within the grave shaft of an intact burial, the primary interment was designated “Burial #-1,” while the disturbed remains were labelled “Burial #-2,” “Burial #-3,” etc.

Hand excavation was conducted with shovels followed by trowels and picks once coffin materials or human remains were encountered. Upper grave shaft soil was discarded, but soil from the level of the coffin and human remains was sifted through ¼-inch screen. The human remains and associated artefacts were exposed, photographed, and planned. More or less detailed notes were taken, depending on the excavator, with special attention paid to details that might not be visible in photographs and osteological features which were expected to disintegrate upon removal. Field measurements of grave stature and long bone lengths were taken when possible. All skeletal elements and artefacts were then removed and carefully packaged for transport to the laboratory in Iowa City. In sub-adult graves where few or no bones were observed, all of the soil from the coffin bottom was bagged for laboratory flotation (to recover tooth crowns). Unfortunately, a total station electronic mapping device was not available for use during this project; all burial locations were recorded with a handheld Global Positioning System unit, with corrected data having a maximum error of 120 cm (Lillie 2013a:7). Field notes recording the locations of burials relative to one another were used for the correction of suspect data when maps were produced using the ArcGIS program.

5.3.2. OSTEOLOGICAL ANALYSES (1994, 2007-2013)

The osteological analysis of the skeletal remains from the Third Street Cemetery by OSA staff (2007-2013) followed the guidelines in Buikstra and Ubelaker (1994) but used recording forms and coding unique to the former Burials Program (now Bioarchaeology Program) of the OSA (see Appendix B for forms). The handwritten forms were entered into a Microsoft Access 2010 database by OSA staff and student workers (Appendix C, digital materials). Cranial and postcranial elements were inventoried and coded for portions present. Preservation and taphonomic damage were described in handwritten notes, but no coding system was employed.

Sex was evaluated by examination of morphological features of the skull (nuchal crest, mastoid process, supraorbital margin, glabella, and mental eminence) and pelvis (sciatic notch, pubic bone, and reconstructed overall shape) (Buikstra and Ubelaker 1994). Occasionally, when the cranium and pelvis were poorly preserved or absent, sexually dimorphic metrics of the femur, tibia, humerus, radius, clavicle, scapula, and talus were also used to estimate sex (Bass 1995; Steele 1976). Sex assignment was left to the discretion of the individual osteologist based on the preponderance of evidence, with the policy that greater weight should be given to pelvic morphology. Sex estimation was attempted only on the remains of adults and older adolescents. Adolescent sex estimation was based, like adult estimates, on the preponderance of evidence, but was generally only attempted when at least one pelvic feature appeared strongly male or female. Given that adolescent male crania often lack the robust features of adult males, female cranial morphology was not considered reliable indicator of sex for adolescents.

Adult age at death was estimated based on evaluation of the pubic symphysis, auricular surface, and cranial and palatal suture closure (Brooks and Suchey 1990; Lovejoy *et al.* 1985; Mann *et al.* 1991; Meindl and Lovejoy 1985; Suchey and Katz 1986). Sub-adult age was estimated based on tooth development when possible (Moorrees *et al.* 1963a, 1963b) and dental eruption when individual tooth formation was not observable (Ubelaker 1989). Skeletal development and epiphyseal closure were also used when preservation was sufficient (Scheuer and Black 2000). Diaphyseal length (Schaefer *et al.* 2009; Scheuer and Black 2000) was utilized for age estimates of younger sub-adults (under the age of around 10 years). In cases of poor preservation, general age range was estimated by comparison of elements/fragments with those of confidently-aged sub-adults (neonatal, 2.5-3.5 years, 5.5-6.5 years) in the OSA comparative collection. For both adults and sub-adults multifactorial age estimation was employed whenever multiple features were observable, with the final age range based on the overlapping portions of the separately determined ranges.

Dental remains were inventoried, and dental wear was recorded according to *Standards* (Buikstra and Ubelaker 1994), except that molars were recorded with a single score rather than four quadrant scores. This wear data was occasionally used to support general age estimates for poorly-preserved adults. Enamel defects (opacities, pits, linear grooves and missing enamel) were recorded and measured using procedures outlined by Goodman *et al.* (1980), with developing teeth only examined if the crowns were three-quarters complete.

Cranial and postcranial pathological observations were recorded using a coding system similar to Buikstra and Ubelaker (1994). General types of bone loss (lytic lesions, porosity, cortical thinning) and bone increase (periosteal new bone apposition, osteomyelitis, tumours), as well as degenerative joint disease were reported for specific element surfaces and coded as active or healed. Specific disease diagnosis was not included in the form/database coding, but detailed notes concerning all abnormalities were written by hand (scanned and archived at the OSA). The final page of the pathology form allowed for the coding of the presence or absence of several conditions, including cribra orbitalia, porotic hyperostosis, spina bifida, spondylolysis, Schmorl's nodes, osteoporosis, osteochondritis dissecans, treponemal lesions, and tuberculosis. The main reference volumes employed for palaeopathological diagnoses and interpretations were Ortner (2003) and Mann and Hunt (2005), though Lovász *et al.* (2010) was consulted for cases of possible tuberculosis, and Lewis (2004) and Hershkovitz *et al.* (2002) were used for the classification of endocranial lesions. Cribra orbitalia and porotic hyperostosis were reported according to severity only (slight, moderate, severe), which was assigned subjectively by each analyst, rather than using a systematic coding system like that outlined in Stuart-Macadam (1991). The status of the lesion (active/healing/healed) was sporadically recorded in handwritten notes. Cribra orbitalia was distinguished from scorbutic lesions of the orbits by the observation of porosity rather than the deposition of porous new bone (Ortner 2003:104). For cases in which cranial vault bones were fragmented, porotic hyperostosis was distinguished from vault changes associated with rickets by observation of the cross-section, which can reveal deposition of sub-periosteal cancellous bone in rachitic individuals (Ortner 2003:394-395). It is possible that some unbroken crania recorded with healed porotic hyperostosis may have been misidentified, as the cross-section could not be examined.

Healed and perimortem trauma were recorded by element and location. Perimortem trauma was distinguished from antemortem injuries by a lack of macroscopically observable healing and from post-mortem damage by oblique fracture angles and uniform colouring of fracture surfaces and element cortex. Only unambiguous cases were scored as perimortem.

All osteological analysis was conducted macroscopically, with use of a 10x hand lens as necessary. Due to budget and time constraints, thin-sectioning, scanning electron microscopy, and aDNA were not available for further investigation of pathological specimens. Medical imaging was not possible, with the exception of radiographs of three crania and two long bones, and CT scans of two crania which were donated by local medical practitioners to gather more information about healed and perimortem trauma. Additional data such as cranial, postcranial, and dental metrics and nonmetric observations were also collected, along with details of dental pathologies (caries, abscesses, calculus), occasional estimations of ancestry, and calculations of stature. This data was not incorporated into the current research, but may be found in the original report (Lillie and Mack 2013) and the original project database (Appendix C, digital materials).

Osteological data collection performed by the various analysts of the comparative cemetery samples generally employed methods similar to those utilized in the analysis of the Third Street population, though some excavations – notably that of the Second Catholic Graveyard and Freedman's Cemetery – predated common usage of

Standards (Buikstra and Ubelaker 1994). The most significant difference noted in data collection strategies relates to the recording/reporting of pathological observations. As some of the variation affected the usability of the data for comparisons with the Third Street and other samples, these differences are addressed in the chapter presenting comparative osteological data (Chapter 8).

5.3.3. ARTEFACT ANALYSIS

Artefact analysis conducted during the original Third Street Cemetery project was divided based on artefact type. The majority of the coffin hardware analysis was undertaken by Cindy Nagel (Lillie *et al.* 2013:167-215). The author of the current work created the typology for coffin lid crosses and plaques, found in almost 13% (114/883) of graves in this sample. Unfortunately, a complete inscription was preserved on only one cross, with partial names or just a few letters legible on six more. Death record and census research led to the identification of two family groups based on these inscriptions (Mack 2013f:255-278).

Clothing artefacts were recorded by Robin Lillie after Mainfort and Davidson (2006), with analysis including material (metal, glass, bone, etc.), manufacture (factory, non-professional), button type (sew-through, shank), size, colour, and decoration. Religious objects were examined by the author, with some assistance from Christian Haunton (Mack 2013e:233-253). Corrosion obscured the details on many of the religious objects, but the author used an electrolytic reduction method to clean religious medals and crucifixes recovered during the 2010 and 2011 excavation seasons. Identification of religious artefacts relied primarily on Ball (2003) and Miller (2001), as well as consultations with a Catholic priest, Father Matthew Worthen of Sacred Heart Cathedral, Pensacola, Florida.

5.4. Project Methods, 2017-2020

5.4.1. ADDITIONAL OSTEOLOGICAL ANALYSIS OF ADOLESCENT REMAINS FOR CURRENT RESEARCH

Age

Though the skeletal remains from the Third Street Cemetery were reburied four years before the current research project began, the author had access to the original database, handwritten analysis forms and notes, and all field and laboratory photographs from the project. These materials were used to re-evaluate age estimates for individuals age 10 to 24 years, originally classified as older children, juveniles, or juvenile/young adult.

During the original analysis, the aging of sub-adults by dental development employed the data presented in Moorrees *et al.* (1963a, 1963b) rather than a newer study (AlQahtani *et al.* 2010) which expanded on the earlier work, examining all deciduous and permanent teeth instead of just the ten permanent and three deciduous teeth included in the original study. As the formation stages of maxillary teeth, which were not included in Moorrees *et al.* (1963a, 1963b), were more often observable in the Third Street sample (due to superior preservation of the mandibular alveolus), the AlQahtani *et al.* (2010) data were considered more appropriate. Additionally, the age ranges provided in the newer reference are more easily incorporated into multifactorial age estimation than the mean dental ages provided by Moorrees *et al.* (1963a, 1963b), particularly since only a single tooth, the third molar, provided the dental age for many of the re-evaluated individuals. This re-evaluation of dental age, based on original analysis notes concerning tooth formation stages, did not incorporate canine root development, as the timing of this is tied more closely to pubertal stage than age (Shapland and Lewis 2013).

Age estimates based on epiphyseal union were also re-evaluated for these Third Street individuals, when possible, using Schaefer *et al.* (2009). This re-analysis eliminated epiphyseal data from elements which have been demonstrated to be tied developmentally to puberty, including the phalanges, distal radius, and iliac crest (Shapland and Lewis 2013). When dental and skeletal data were both available, the age ranges provided by both methods were combined, and a final age estimate for each individual was determined based on overlapping portions of the ranges. For instance, a male with an unfused distal humerus (<14.0-18.0 years), active fusion of the humeral head (~16.0-21.0 years), and a maxillary third molar with the root ½ complete (15.5-20.5 years) would be assigned an age of 16.0 to 18.0 years.

Multifactorial age estimation, using all criteria available, is recommended by White *et al.* (2012:406-408) and is consistent with the aging methods used for most of the comparative samples. All individuals found to have age estimates overlapping the adolescent age range defined by Buikstra and Ubelaker (1994), 12 to 20 years, were included in the adolescent age class at the centre of this study, though the maximum extent of age estimate ranges for these individuals spans from 11.5 to 25.0 years. For some calculations related to puberty (Chapter 7) and mortuary treatment of social adolescents (Chapter 9), age midpoints were determined based on the minimum and maximum ages of the multifactorial range for each individual. These midpoints are distinct from the dental mean ages used in some other adolescent studies (e.g. Lewis *et al.* 2016a).

Sex

Features of the distal humerus, ilium, and mandible have been found to demonstrate sexual dimorphism in sub-adults, and may be used for sex estimation (with over 70% accuracy) in individuals as young as 10 years (Lewis 2018b; Rogers 2009). However, due to the lack of images of these sexually dimorphic features, sex estimation of adolescent individuals previously described as “indeterminate” could not be attempted. Likewise, adolescents previously assigned sex were not re-evaluated. Three indeterminate adolescents were, for the purpose of this study, assigned sex based on clothing items recovered from the grave, including beaded high-heeled shoes and a beribboned and beaded burial outfit (both female) and a collar stud (male).

Pubertal Stage

During the re-analysis of the Third Street adolescents, pubertal stage was assessed according to Shapland and Lewis (2013), by evaluating the developmental stage of the mandibular canine and the epiphyseal fusion of the distal phalanges, iliac crest, and distal radius. Unfortunately, the development of the hamate (Shapland and Lewis 2013) and cervical vertebra maturation (Shapland and Lewis 2014) could not be evaluated due to a lack of photographs or notes regarding the pertinent features.

The Milwaukee County Poor Farm Cemetery (MCPFC) Adolescents

During the current research project, the author re-analysed the physical skeletal remains of 14 individuals from the MCPFC collection whose published age ranges or epiphyseal fusion notes suggested they might fall within the defined range of adolescence (12 to 20 years). This analysis followed the methods detailed above for age, sex, and pubertal stage estimation of adolescents. One individual was found to be a misidentified adult whose irregular ischial tuberosity was mistaken for an unfused surface.

5.4.2. ARTEFACTS FROM ADOLESCENT GRAVES, GRAFTON CEMETERY

Data concerning artefacts recovered from graves at Third Street and the comparative cemeteries was taken from publications, spreadsheets, and photographs shared by the original excavators, with one exception. The author travelled to the Illinois State Museum Collections Center in Springfield, Illinois, to record and photograph the artefacts from adolescent graves at Grafton Cemetery.

5.4.3. HISTORICAL DATA ANALYSIS

Social Adolescence in Nineteenth-Century Dubuque

To determine whether or not social adolescence – defined as a period of transition between familial dependence and independence – existed in nineteenth-century Dubuque, the author synthesised previous research on the subject in the eastern United States with accounts found in biographical sketches and memoirs originating from the Dubuque area. Data from primary sources listed in Section 5.2.1, specifically Dubuque County marriage records (1835-1870) and the 1860 Census, were also compiled to establish the age ranges of social adolescence for females and males, based on average marriage ages, school attendance, employment, and residence patterns. The results of this study are detailed in Chapter 6.

Cause of Death in Nineteenth-Century Dubuque and the United States

Use of the Third Street Cemetery predates the establishment of state-wide death and burial registration in Iowa. However, data from the Burial Register of St. Raphael's Cathedral, newspaper obituaries, U.S. Census Mortality Schedules (1850-1880), and Dubuque City Cemetery records (1855-1875) were used to explore the most common causes of death for different age classes within the community. Dubuque population totals for the sample census year 1860 were compared with City Cemetery death records for the same 12-month period to estimate death rates for each age class. Causes of death which potentially affect the skeleton (tuberculosis, meningitis, typhoid fever, trauma, etc.) were identified in the Dubuque records and the prevalence of these causes among adolescents was calculated to create a predictive model for osteologically observable pathology. This Midwestern model was then applied to the adolescent samples from Third Street and the comparative cemetery populations. Burial records from the Campo Santo de San Fernando (San Antonio, Texas) and a limited number of funeral bills from an undertaker in Dallas (Texas) were consulted to explore regional differences in adolescent proportional mortality.

5.4.4. PROJECT DATABASE: AGE, SEX, AND COMPLETENESS CODING

In order to explore the research questions posed in Chapter 1, two groups of burial attributes – relating to osteology/pathology and mortuary display, respectively – were selected, and this information was used to create a database presented in a Microsoft Excel spreadsheet (Appendix D, digital materials). Each individual/burial was entered on a separate row, with Columns A through S dedicated to osteological data (age class, sex, completeness of dental and skeletal remains, pathological observations) and Columns T through CB concerned with mortuary treatment (specific clothing items, grave goods, coffin materials). Once this database was established for the Third Street Cemetery population, it then served as a template for the collection of data from the comparative cemetery samples, as well. See Appendix E for a detailed explanation of database entries by column.

Age Class

From the original Third Street Cemetery collection, the sample was restricted to burials with sufficient integrity/preservation for classification into the four age groups: infant (0-3 years, n=395), child (3 to 12 years, n=75), adolescent (12 to 20 years, n=43), and adult (20+ years, n=370). This modification of Buikstra and Ubelaker's (1994) age classification system eliminates the foetal category, as no remains from Third Street were unequivocally determined to be foetal rather than neonatal. The separation of adults into young, middle, and old adults was also eliminated as unrelated to the research questions, which explore differences between those who died in adolescence and those who survived into biological and social adulthood. Additionally, the broad age ranges assigned to many mature skeletons in the collection – "at least older young adult," "middle to old adult" – were not easily divided into specific adult age classes. For sub-adults assigned age estimates which span both the infant and child classes, the midpoint of the range was used to determine the appropriate age class, following Lewis (2016:146). For instance, an individual determined to be 1.5 to 3.5 years old has a midpoint age of 2.5 years and was thus classified as an infant rather than a child.

While it is acknowledged that neonates (0.0-0.5 years), infants in arms (0.5-1.0 years), and toddlers (1.0-3.0 years) can be expected potentially to represent different social age groups, as well as demonstrating differential exposure and susceptibility to health risks, the broad age group of 0 to 3 years proposed by Buikstra and Ubelaker (1994) was employed in this study for reasons of practicality. Poor skeletal preservation in sub-adult graves in both the Third Street Cemetery and the comparative cemeteries prevented precise age estimates in many cases, with individuals assigned to the infant age class based on overall size of the remains or of the coffin/grave, in the absence of remains. Even in cases where tooth crowns were sufficiently preserved for dental age estimates, the ranges produced often included both the neonate and infant categories or the infant and toddler categories, or all three. Nearly 24% (94/395) of the youngest sub-adults from Third Street were assigned age ranges spanning 0.45 to 1.5 years, confounding separation. However, the broad age classification is not merely a tool of convenience, as common circumstances experienced by individuals at the age of 0 to 3 years unite them. Children under the age of four were not permitted to wander the streets unaccompanied, and thus had a lower risk of accidents and violence outside the home. Infectious disease mortality risk remained high for the age group due to immune system development (McDade 2003:114). Additionally, rapid bone turnover makes individuals under four years more likely to exhibit bony reaction to pathological processes (Lewis 2018a:8). Though this age class would be more accurately labelled “infant to young child,” the abbreviated “infant” will be used throughout this volume in accordance with common osteological practice in the United States (White *et al.* 212:384) and for the sake of consistency with materials previously published regarding the Third Street project and other American cemetery excavations (Buikstra *et al.* 2000; Lillie and Mack 2015; Ubelaker and Jones 2003).

Sex

To simplify the sex categories, individuals originally categorised as possibly male or possibly female were entered into the database as male or female, following Lewis (2016:146). “Indeterminate” was entered for infants, children, and those adolescent and adult individuals for whom sex could not be evaluated.

Integrity and Completeness

The integrity score indicates the level of disturbance, either recent or historic, to the burial feature. A Code of 1 signifies that a burial was undisturbed or minimally disturbed. For example, a grave in which an individual’s foot or part of a coffin wall or lid was removed by heavy machinery would be considered minimally disturbed. Code 2 indicates significant disturbance, with loss of up to half of the coffin or the removal of most of the soil above the human remains (and thus the loss of most coffin lid hardware). Code 3 indicates that the burial feature was previously disturbed by intentional exhumation, with only a few skeletal elements and artefacts left behind, or that human remains were accidentally disinterred and redeposited either by historic gravediggers or by modern earth-moving equipment. Only burials with Code 1 or 2 integrity were included in the investigation of mortuary treatment.

The completeness of the anterior dentition was recorded as a total count of observable incisors and canines, both deciduous and permanent. Visible (loose) unerupted teeth were included in the count if the crown was greater than three-quarters complete, following the original Third Street protocol. Teeth with more than 30% crown loss due to wear and teeth with large caries were excluded from the count as unobservable for LEH, following Duray (1996).

The cranial remains of each individual were coded by the percentage present. Only individuals with a cranial status of 1 (>75% present) or 2 (25-75% present and at least one orbit observable) were considered observable for cranial pathology.

Coding of completeness of the postcrania employed a system similar to that used for the crania, with “0” indicating absence of all postcranial elements. Code 1 (75-100%) was used for complete individuals and individuals with all four limbs (and girdles) present, even if the thorax was poorly preserved. Individuals with well-preserved ribs and vertebrae were also coded as 1 if only one limb was missing due to taphonomic damage. An individual coded as 2 (25-75%) might be missing most of the thorax and have only long bone shafts preserved. Though not as complete as individuals classified as Code 1, Code 2 skeletons still have all regions of the skeleton represented to some extent. Individuals coded as 3 (< 25%) are represented only by, for instance, a single arm and shoulder girdle or both femora and one tibia. Code 4 indicates that only a single element was recovered.

Distinguishing between Codes 1 and 2 or 2 and 3 was sometimes difficult. To remove subjectivity, a standard method was followed. Each complete limb (three long bones plus scapula/clavicle or os coxa) or complete thorax was assigned a value of 1. Partial limbs were assigned a corresponding fraction – 0.25, 0.5, or 0.75. These five values were added up and divided by 5 for the percentage of completeness. For instance, a skeleton with a complete thorax (1), complete left arm (1), right arm missing the forearm (0.5), right leg absent (0), and left leg missing the distal halves of the tibia and fibula (0.75), would be valued at 3.25/5, which is 65% or overall Code 2. Hand and foot bones were not included in the calculations because they were generally poorly preserved or absent at the Third Street Cemetery. Only individuals with postcranial Code 1 or 2 status were considered when tallying the incidence of postcranial pathology and trauma.

5.4.5. PROJECT DATABASE: PATHOLOGY RECORDING

As shown in the database guide in Appendix E, all dental, cranial, and postcranial pathological observations were recorded for each individual (from Third Street and the comparative cemetery sample), with the exception of conditions caused by age or activity (degenerative joint disease, Schmorl's nodes, enthesophytes) or which occur almost exclusively in adults (e.g., gout), as these conditions are not related to the research questions and are not comparable across all age classes. The following six pathological observations were selected as the foci of the investigation and were recorded in dedicated columns: linear enamel hypoplasias, cribra orbitalia/porotic hyperostosis, labyrinthine endocranial lesions, nonfocal periosteal new bone formation, probable tubercular/pulmonary disease lesions, and perimortem trauma. All other pathological observations from the original analysis forms were recorded in the "other pathology" column.

Linear Enamel Hypoplasias (LEH)

The unit of analysis under consideration for this study was the individual. Ultimately, only presence or absence of LEH was presented for each individual, since more detailed analysis, such as frequencies per tooth type or formation age range, was outside the scope of this investigation. Only macroscopically-visible linear hypoplasias (grooves or lines of pits) were tallied for this study, as opacities and missing enamel are difficult to identify reliably in archaeological materials with taphonomic damage and staining. Mulberry molars and Hutchinson's incisors were recorded in the "Other pathologies" column, as they can be directly linked to congenital syphilis (Ortner 2003:595-596).

Only LEH observed on anterior teeth, both deciduous and permanent, were included in the database. Though the elimination of molars discards information about later childhood stress events, the focus on anterior teeth makes the data more easily comparable across age classes, since adults in the Third Street population experienced significant molar loss. In order for an individual to be considered free of LEH, at least 25% of the anterior dentition (three teeth) had to be observable and without defects. An individual was considered positive for LEH if at least two anterior teeth were present and carried defects with matching locations (Malville 1997).

Cranial Pathology

During the original osteological analysis, cribra orbitalia (CO) and porotic hyperostosis (PH) were coded subjectively according to severity (slight, moderate, severe). While it was not possible to re-evaluate cases of PH for the current study, photographs of individuals with CO allowed the author to verify that all viewable instances involved changes to the cortical surface of the orbit, rather than the deposition of new bone associated with scurvy. Photographs also allowed for the distinction between active and healed lesions in many cases. Because of the limitations of the data, however, only frequencies of presence/absence within each age class were reported.

Endocranial lesions observed on remains from the Third Street Cemetery were primarily capillary formations and hair-on-end formations, Lewis (2004) Types 3 and 4. Deposits of light-coloured fibrous bone (Type 2) were also recorded as possible precursors to these lesions, but these were rarely observed. For the purpose of this study all three lesions types were tallied together under the term “labyrinthine” endocranial lesions to distinguish them from other types of bone apposition or focal lytic lesions that might be observed on the endocranial surface of vault elements (Lillie 2013b:152-155). The frequencies of presence/absence were tallied for each age class.

Postcranial Pathology

As this investigation was concerned with serious health insults and systemic disease rather than antemortem trauma, an effort was made to distinguish periosteal new bone deposition due to inflammation from new bone formation due to fractures or soft-tissue trauma. Unfortunately, the skeletal elements could not be re-examined, and photographs from the Third Street project were not sufficient to determine whether the underlying bone cortex was affected or whether the new bone was purely sub-periosteal. Periosteal new bone formation was considered more likely due to systemic illness if bony reaction was present on multiple elements and was not associated with a healing or healed fracture. Only this nonfocal type of periosteal new bone formation was recorded in the database column, along with the number of elements affected. Ribs with periosteal new bone formation were not included in this column but were classified as possible tubercular or pulmonary disease lesions.

Lesions recorded as evidence of tuberculosis (TB) included lytic lesions of the vertebrae and sacroiliac surface (Ortner 2003:230-239; Roberts and Buikstra 2019: 327-332). Periosteal bone deposition on the pleural rib surface was considered evidence of either TB or other pulmonary disease (Matos and Santos 2006). Though skeletal TB can manifest in numerous other elements (Roberts and Buikstra 2019), and though researchers have identified suites of pathological markers that may point to TB in the absence of pathognomonic lesions (Lewis 2011; Lovász *et al.* 2010), particularly in sub-adults, the author's inability to re-examine human remains from Third Street resulted in the conservative coding of likely TB lesions in the database. However, in Chapter 7, differential diagnoses of adolescents with groups of lesions potentially indicative of TB are discussed.

Perimortem Trauma

Perimortem trauma was recorded conservatively during the original Third Street Cemetery project. The affected elements for each individual – both from Third Street and the comparative cemeteries – were entered into the database. Presence/absence was of primary concern, though age-related patterns of trauma types are also discussed. Frequency in each cemetery population was calculated based on the number of individuals observable in a given age class, with observability defined as Code 1 or 2 for both the cranial and postcranial remains. However, it is acknowledged that perimortem trauma cannot truly be considered "absent" in skeletons that are not largely complete, as any missing element may have been affected. In fact, it is possible that elements affected by trauma might be more poorly preserved. A common understanding in forensic anthropology is that trauma can affect, and even hasten, decomposition processes, though recent experiments have called this assumption into question (Smith 2014). Antemortem (healed) trauma observations were not included in the current study as they relate neither to acquired immunological frailty nor to perimortem events.

5.4.6. PROJECT DATABASE: RECORDING MORTUARY ATTRIBUTES

This study focuses on the three burial attributes which demonstrate variability in nineteenth-century graveyards – coffin decoration, burial attire, and grave goods – with an emphasis on levels of mortuary display. The individual elements of coffin decoration in each grave feature were entered into the database, and subsequently each burial was classified in to one of three categories, following Raemsch and Bouchard (2000). Coffins with only utilitarian hardware (nails, simple screws) were classified as plain. Those with no decoration other than white metal coffin screws were designated as simple. This is a departure from Raemsch and Bouchard (2000), who considered dummy screws, domed brass tacks, and simple furniture-type handles to fall within the simple hardware category, as well. For the current study, those items, in addition to decorative coffin handles, hinges, viewing panes, caplifters, thumbscrews, escutcheons, ornamental tacks, and coffin lid plates, constitute elaborate coffin decoration, the third category.

The classification of burial attire, based on clothing fasteners and decorative elements entered into the database, also follows Raemsch and Bouchard (2000) in that the two categories of interest are shrouds and day wear. However, the category of shrouds/gowns has been expanded to include garments with certain types of buttons, based on the work of Aldridge (2008) and evidence from trade catalogues (e.g., Wayne Hardware Co. 1874). Graves with no clothing hardware or only copper straight pins recovered are classified as shroud/gown burials, but so too are those with only one type of light-coloured button. Plain white Prosser buttons, which are mass-produced porcelain buttons made through a process patented in 1840 (Mainfort and Davidson 2006:172; Sprague 2002), are included in this category, along with shell, bone, and wood buttons. However, if multiple button types are present, or a combination of buttons with other clothing fasteners (buckles, snaps, hooks and eyes), it is assumed that the individual was buried in an outfit composed of multiple garments, which is consistent with day wear. Day wear is also assumed from the presence of metal buttons, which were not used for sleepwear or shrouds, decorative buttons (such as hobnail, calico, or coloured Prosser buttons or vulcanised rubber buttons), or decorative accents such as beading or cuff links.

Grave goods are divided into two categories, religious and secular. Religious grave goods include rosaries, chaplets, religious medals, crosses/crucifixes, and remnants of children’s flower wreaths. Though the individual object types were entered in separate database columns, the number of items is not crucial, as burials were coded simply for the presence or absence of religious grave goods. Secular grave goods were described in the database, but were also tallied as present/absent, and include any items not related to the coffin, attire, or canonical religious beliefs[1].

5.4.7. STATISTICAL ANALYSES

The Statistical Package for the Social Sciences (SPSS) was used for most statistical analyses performed as part of this investigation. For the palaeopathological study, prevalence rates by age class for the selected observations were calculated for each cemetery. The frequency data were used to measure differences between age classes within each cemetery sample, and later within the pooled sample. A chi-square test of independence was used to test for significance at the $p<0.05$ level (Cleophas and Zwinderman 2010; Thomas 1986:264-302). This same process was used to investigate possible age-related patterns in combinations of both early life and later/perimortem skeletal markers. Spearman's rho was used to determine whether or not correlations exist between observations of the individual skeletal markers of pathology (Knapp 2017); Statistical Analysis System (SAS) software was utilised for these calculations. Nineteenth-century death records were used to create a model for predicted prevalence of skeletally-observable pathology among adolescents. These prevalence rates were compared with osteological observations from the cemetery samples using a chi-square goodness-of-fit test (Thomas 1986:264-302).

Two types of analyses were applied to mortuary treatment. The relationship of the individual burial attributes to one another and to age class was evaluated for the Third Street Cemetery using logistic regression (Cleophas and Zwinderman:39-42). Next, combinations of burial attributes were classified into burial types, with frequency calculated by age. The differences between age classes within the cemetery samples were tested for significance using a chi-square test of independence (Thomas 1986:264-302).

1 As discussed by Davidson (2004b, 2010) and Puckle (1926), seemingly nonreligious items may be placed in a grave in accordance with folk beliefs or holdovers from pagan traditions. While these objects could also, then, be classified as religious in nature, they are distinct from the mainstream Christian objects designated "religious grave goods" here.

II. RESULTS

Chapter 6

Social Adolescence in Nineteenth-Century Dubuque

As noted in Chapter 1, the conception of adolescence as a subject worthy of study did not emerge until the end of the nineteenth century and early twentieth century, when it was dealt with primarily as a topic of psychology (Arnett 2006; Kett 1970:283). Later research concerning the emergence of adolescence in America during the early to mid-nineteenth century has focused on sources from the East Coast, where the evangelical movement of the Second Great Awakening wrought social changes not necessarily experienced in the rest of the country (e.g., Demos and Demos 1969; Kett 1970, 1977; Novak 1977; Rosenberg 1973). As Baxter (2019b:22-23) points out, nineteenth-century discourse concerning aspects of childhood and adolescence originated from publishing centres in the northeast, and these readily available sources have, not surprisingly, formed the foundation for later studies. During the current research project, no publications were found which significantly address the transition to adulthood in the Midwest or in American pioneer communities in this time period. As a supplement to the scant information available on the subject, data were collected from primary sources to determine what age range coincided with social adolescence in nineteenth century Dubuque.

6.1. Previous Research

According to Kett (1970:294-296; 1977), because school attendance, apprenticeship, and wage work did not end or start at prescribed ages for boys – and, in fact, often overlapped – their social identity was not strongly linked to chronological or even developmental age in the nineteenth century. Adolescence in girls, on the other hand, was directly tied to the visible onset of puberty during this period. Thus, the beginning of adolescence was signalled for males by changes in their daily responsibilities and for females by changes in their physical appearance. Two nineteenth-century photographs from the Dubuque area (Figures 6.1 and 6.2) show presumed adolescent boys perusing a dry goods catalogue and a girl with a developed bust.

Figure 6.1. Undated photograph of two presumed adolescent boys (unidentified) in Dubuque. Image reproduced with permission of the Dubuque County Historical Society.

Figure 6.2. Photograph dated 1866, showing an unidentified adolescent girl or very young woman from Dubuque. Image reproduced with permission of the Dubuque County Historical Society.

The end of adolescence (or beginning of adulthood) was somewhat more clearly defined. The age of majority was fixed at 21 across most of the country (Syrett 2015:112). Yet as early as the 1840s, writers were advocating against marriage or reproduction before both the bride and groom reached the age of 25 (Rosenberg 1973:137). Puberty was believed to be a time of physical and psychological development that must not be interrupted for fear of permanent damage. It is interesting that 25 was selected as the age at which full maturity was attained, since this implies a belief that puberty continues well past any outward evidence of physical growth and development. Today, the World Health Organization recognises two overlapping transitional stages between childhood and adulthood; adolescence spans the ages of 10 to 19 (coinciding with physical puberty), while "youth," ages 15 to 24, is considered a period of education and training extending past biological maturity (World Health Organization 1993, 2014). Nineteenth century advocates for later marriage may have been concerned with the moral development of young brides and grooms, rather than the strictly physical. Regardless of East Coast ideals, however, these exhortations against early marriage would not have been necessary unless marriage before the age of 25 was relatively commonplace.

Riley (1981:84-85) suggests that in frontier communities, children were so needed as laborers that families were unlikely to part with them just when they became most useful, having attained their full potential growth and strength. From an economic perspective, adolescence was the pay-out after years of investment by the family, the point at which the child's contribution to the household began to approach the level of adult input (Riney-Kehrberg 2000). Thus, most women did not marry in their early teens, as is popularly believed (Riley 1988:49). A demographic study of Texas in the mid-nineteenth-century found that most offspring did not marry until their mid-twenties (though unmarried males of 17 or older could acquire land), while in Missouri the average marriage age for women was nineteen, for men twenty-four (O'Brien 1984:283; Williams 1969). Riley (1981:85) admits, however, the need for further research into the question of marriage age in Iowa.

One publication specific to the Dubuque area addresses the importance of male offspring contributions to family economy in the second half of the nineteenth century. Russell Johnson's (2003) study comparing 1860 and 1870 Census records found that households which included at least one returning Civil War veteran son fared more poorly than those with non-veteran sons in residence. The loss of the adolescent or young male contribution for a period of months or years during the war, and in some cases the long-term loss of the contributor due to disability, had a detrimental effect on financial well-being which lingered long after the end of the conflict (Johnson 2003:302-303).

6.2. Teenagers in Dubuque's Official Records

The previous research presented above established that some activities, such as school attendance, were reserved primarily for immature persons, while some belong exclusively to adults, such as naturalisation, voting, and, for the most part, marriage. Two clear markers of adolescence are identified, formal apprenticeship and high school/college enrolment, but these were not universal; many Americans passed through their teenage years without doing either. Work outside the home could be undertaken as early as childhood but was understood to signify a transition *towards* adulthood. Residence outside the family home can be understood the same (Kett 1970). Though it was common for adults, including married couples, to continue residing in their parental homes, the establishment of one's own household necessarily conferred the status of adulthood (Modell *et al.* 1981).

In the nineteenth century, the voting age in Iowa, as well as the rest of the United States, was 21 years (Field 2015; SHSI 1970:63 [1870]). The age requirement for citizenship was also 21, and a survey of records from Dubuque County, dating from 1834 to 1856 and including more than 2,800 entries, found all men submitting declarations for naturalisation were 20 years or older, with the exception of one 19-year-old (Baumhover 1991; Field 2015). The legal age for women to marry without parental consent was 18, as evidenced by the oaths concerning the bride's age recorded in Dubuque County marriage license returns from the 1840s (Daughters of the American Revolution [DAR] 1960). Iowa also lowered the age of majority for females to 18, so that young wives could hold property and sign contracts in conjunction with their husbands (Secretary of the Territory 1843:304; Syrett 2015:112-114).

To refine the age range of adolescence, supplementary data was collected from Dubuque County marriage records and the 1860 Census. The year 1860 was selected because 1) it falls approximately at the midpoint of the Third Street Cemetery's use period, 2) it postdates the expansion of the cemetery onto the property where most of the excavation took place, and 3) it predates the Civil War, which reduced the population of young men in Iowa, through both death and migration (Figure 6.3). Unfortunately, though the census pages can provide information concerning age, occupation, and place of residence, the records are not as reliable regarding school attendance and new marriages, due to the aforementioned failure of some Dubuque census takers to fill in the right-hand columns, including "Married within the year" and "Attended School within the year." Fortunately, the census workers also seem to have ignored the instruction in the occupation column, which requires that only the professions of those over the age of 15 be recorded.

Figure 6.3. Daguerreotype photograph of an unidentified adult man with an adolescent boy in uniform. Civil War era (undated), Dubuque. Image reproduced with permission of the Dubuque County Historical Society.

6.2.1. MARRIAGE RECORDS

Marriage licenses and returns from 1835 to 1851 (transcribed by Dubuque genealogist Tom Schlarman) were surveyed to determine the range of marriage ages for brides and grooms. Ages were reported in these records only occasionally, though it appears age was always given when the bride was under the age of consent. A graph presenting the ages at marriage of 225 brides and grooms is found in Figure 6.4. One woman and four men over 50 were eliminated because these records almost certainly represent second marriages.

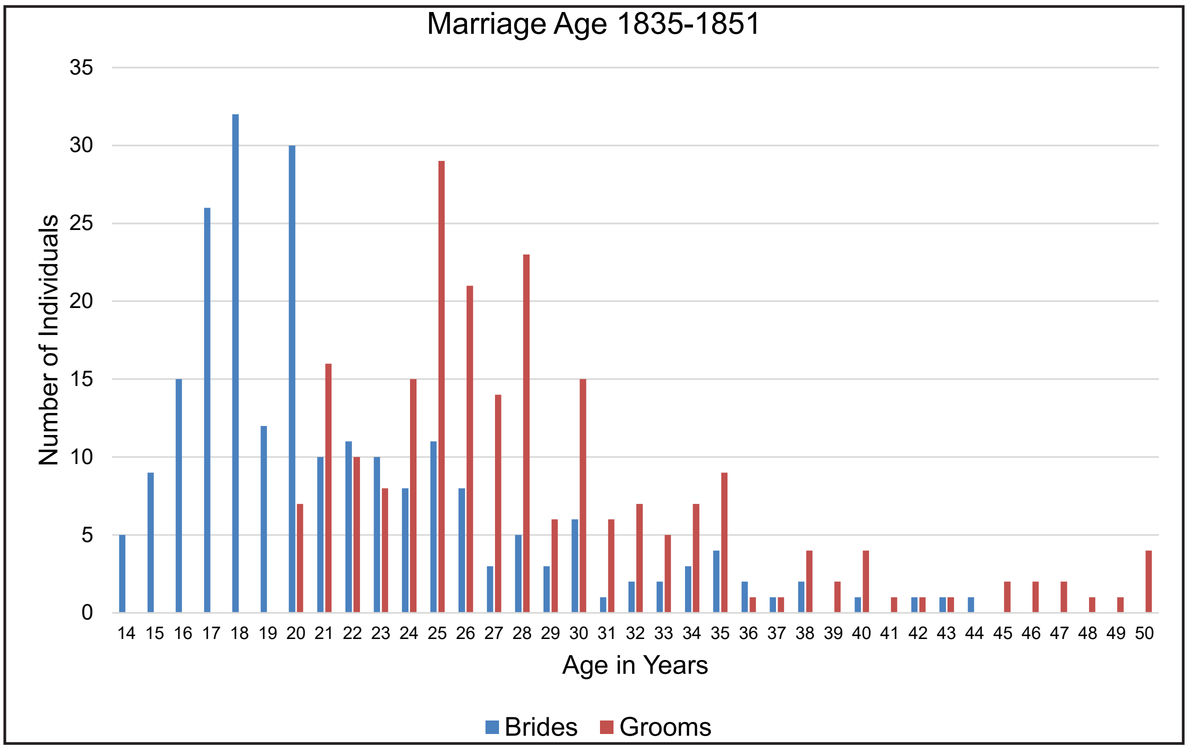

Figure 6.4. Graph showing the number of brides and grooms of each age (from 14 to 50) who were married in Dubuque County between 1835 and 1851.

In contrast with expectations based on work by previous researchers, the data include some surprisingly young brides, including five 14-year-olds. However, not a single groom was under the age of 20. Just over 60% (136/225) of men got married between the ages of 21 and 28. The peak marriage years for women were 17 through 20, representing 44.4% (100/225). The average bridal age was 21.7.

The young bridal ages seen in these records are directly related to the pioneer time period they represent. The scarcity of women in early Dubuque has been emphasised in county histories (Gue 1903; Oldt 1911), and likely led to marriages of necessity. By the time Iowa's population increased sufficiently to achieve statehood in 1846, there were no more 14-year-old brides in Dubuque, and licenses for 15- and 16-year-olds decreased.

Inconveniently, Dubuque marriage licenses contemporary with the later addition to the Third Street Cemetery ceased to include age information at all. To compensate for this deficiency, the author compiled a list of couples who were married in the year leading up to two census enumerations, 1860 and 1870, then searched for the couples in the respective census pages (using Ancestry.com) and recorded their ages. When names were too common (e.g., John and Mary Smith) to be certain that the individuals listed in the census were the newlyweds, those records were skipped. Many couples could not be found in the records at all, having moved away from Dubuque after marriage. The ages presented in Figures 6.5 and 6.6 may be one year older than the age at marriage, as any of these individuals may have had a birthday between nuptials and enumeration.

Marriage records from July 1859 to May 1860 were compared against the 1860 Census, which commenced on June 1 of that year. The results of this search are presented in Figure 6.5. Few brides (5.4%, 5/92) were married under the age of consent. The most common marriage ages were 18 to 22, accounting for 54% of the brides (50/92). Two 19-year-old grooms appear in the records, but the remainder were 21 years or older. Dubuque County marriage records from July 1869 to May 1870 (DAR 1993, 1994, 1995, 1996) were compared with the 1870 Census. Figure 6.6 shows results similar to those in the 1860 graph. For this year, the youngest bride was 17 and the youngest groom 20. The most common marriage ages for brides were 18 to 23, accounting for 65% (74/113). The most common marriage ages for grooms were 22 to 26, accounting for 50% (55/109).

All three datasets are combined in Figure 6.7, which illustrates the numbers of brides and grooms of each age. Despite the outliers – the barely pubescent brides from the early days of the settlement and the older gentlemen likely taking second wives – it is clear that marriage was most common between the ages of 17 and 25 for females and between 21 and 30 years for males. The average marriage age for brides was 22.1 years, for grooms, 27.8 years. Though some men married before the age of majority, those under twenty were evidently not regarded as adults capable of the responsibilities of wedlock. Though mid-teen brides were not unheard of, particularly when the population of the territory was still sparse, marriage records indicate that most families agreed with the conventional thinking that eighteen was the youngest appropriate age for women to be married.

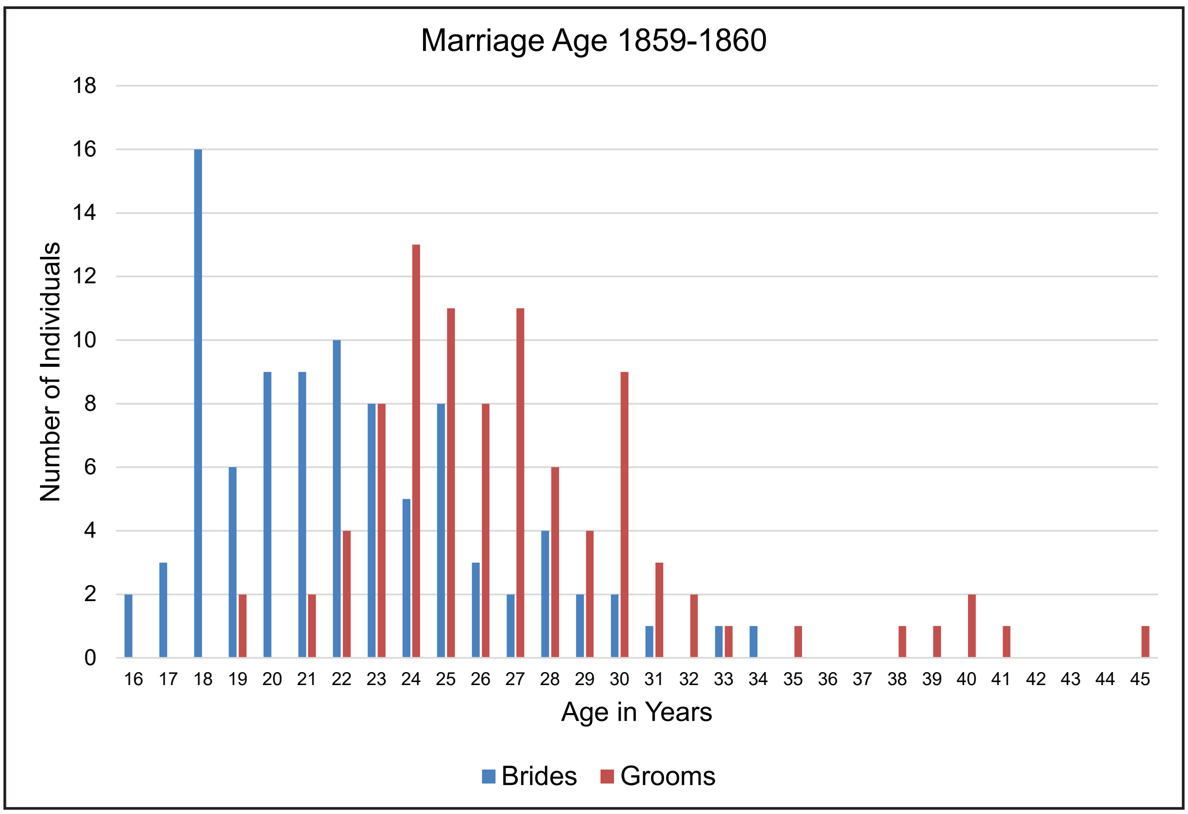

Figure 6.5. Graph showing the number of brides and grooms of each age (from 16 to 45) who were married in Dubuque County between 1859 and 1860.

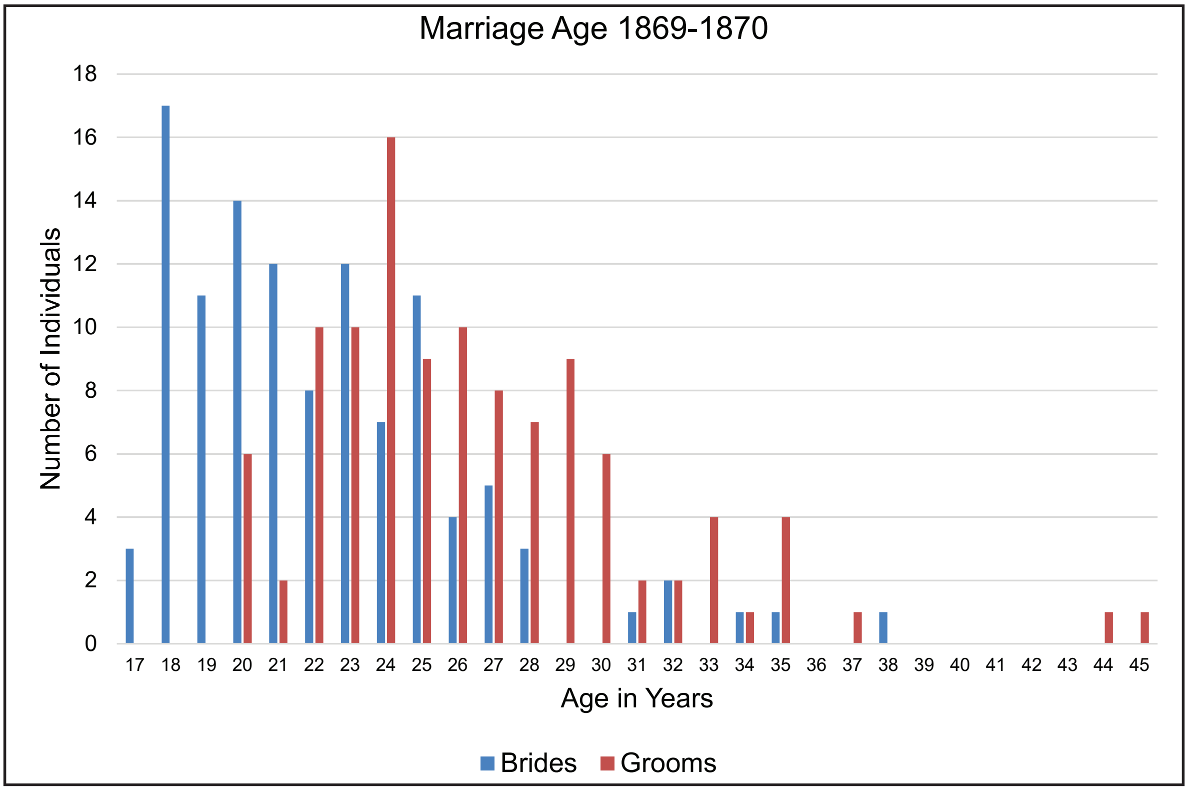

Figure 6.6. Graph showing the number of brides and grooms of each age (from 17 to 45) who were married in Dubuque County between 1869 and 1870.

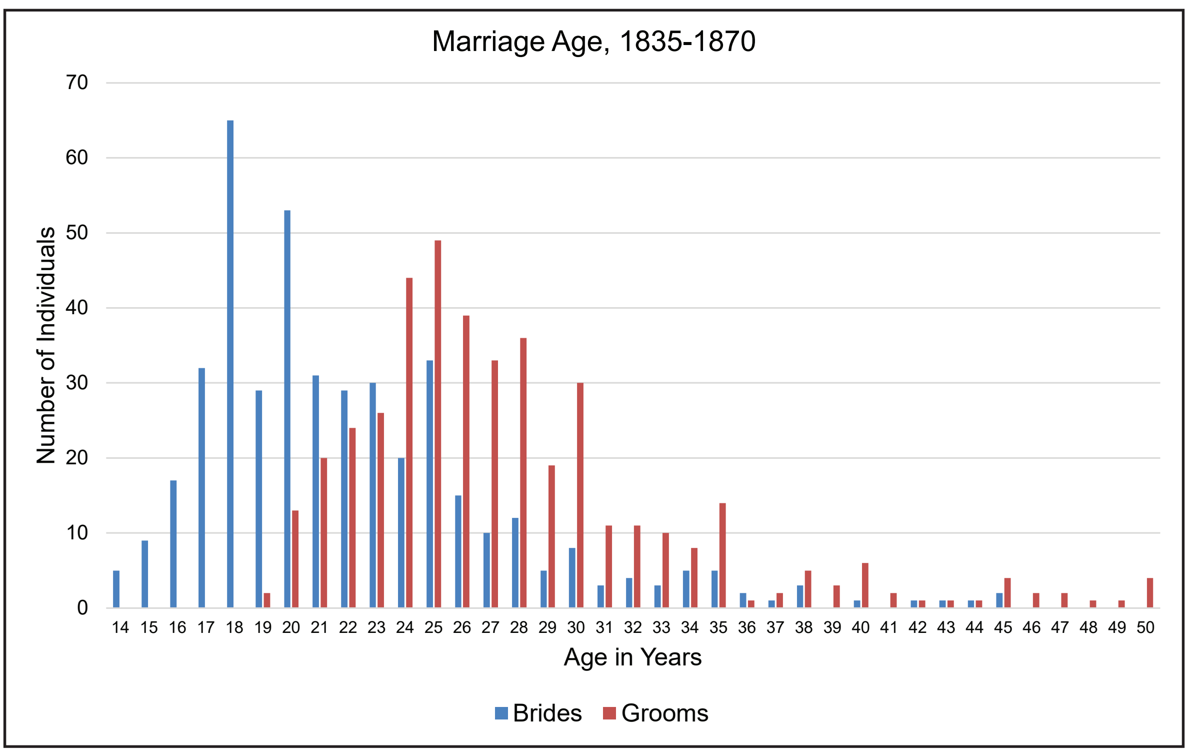

Figure 6.7. Graph showing the number of brides and grooms of each age (from 14 to 50) who were married in Dubuque County between 1835 and 1870.

6.2.2. THE 1860 CENSUS

According to federal census tabulations from 1860, Dubuque County had 3,261 residents between the ages of 10 and 14, and 2,985 between 15 and 19 years (Kennedy 1864). The figures in such census books are of little use, though, since they give no further details concerning these adolescents and since they utilise five-year age blocks, which include 10- and 11-year-olds, who were still considered children, with those transitioning to adulthood. To obtain more suitable data, a page by page review of the returns from the City of Dubuque was undertaken. In all, 1,066 girls and 789 boys between the ages of 12 and 19 were identified, a total of 1,855 teenagers out of 12,998 residents (14.3%). Data concerning each of these individuals was entered into a spreadsheet, including sex, age, occupation (if any), place of residence (parents' home, away from home, or own household), and whether or not the person attended school in the last year.[1]

The number of adolescents reported as attending school (Table 6.1) was relatively low, as education was not compulsory in Iowa until 1902 (Riney-Kehrberg 2000:128-132). In looking at the figures, one is immediately struck by the higher rate of school attendance among teenage males in contrast with females. Both groups show steady attendance rates from age 12 to 13. Males show a slight decline by the age of 14, and attendance for both males and females drops off at 15. The decrease in the proportion of females enrolled in school is dramatic from the age of 16 onward; for males, who were likely attending one of Dubuque's small colleges, the decline continued gradually. The implication is that most girls were occupied with preparations for adult life earlier – from 17 years – than boys were. In few instances were school and work undertaken within the same year. Just seven boys, age 15 to 18 years, are recorded with both an occupation and school attendance, and none of the working girls attended school.

1 The data employed in the current study are similar to those collected by Modell *et al.* (1981) in their study of the transition to adulthood, but without longitudinal and cohort-based analyses.

Table 6.1. School attendance by teenagers in the City of Dubuque as recorded in the 1860 Census.

Age in years	# of females in school/total females	% of females in school	# of males in school/total males	% of males in school
12	68/125	54.4	96/126	76.2
13	63/120	52.5	67/91	73.6
14	65/124	52.4	59/95	62.1
15	44/133	33.1	39/92	42.4
16	20/142	14.1	29/111	26.1
17	4/133	3.0	17/98	17.3
18	5/156	3.2	10/98	10.2
19	3/133	2.2	5/78	6.4
Total:	272/1066	25.5	322/789	40.8

Table 6.2 presents all of Dubuque's teenagers, divided by age, sex, place of residence, and whether or not they were listed with an occupation. More than half of these individuals still lived in their parental home and were not listed with an occupation. This near-child-like status was recorded for 63% (672/1066) of females and 60% (475/789) of males. The proportion of teens in this situation decreased as age increased. For females, 84% of 12-year-olds (105/125) were at home and not working, while 49% (65/133) of 19-year-olds were in the same position. For males, the numbers are 93% of 12-year-olds (117/126), 13% of 19-year-olds (10/78).

Given the high percentage of 12-year-olds living at home and not working, it appears that they were still considered children. Several of the 12-year-olds enumerated in households of different surnames (living "away") appear to be orphans or visitors, rather than apprentices, as they are listed with siblings in the same residence. Only three 12-year-olds are listed with occupations. The boy listed as a cooper was evidently learning the family business from his father and two older brothers, also listed as coopers. The two girls were servants. Given the long-standing tradition among the European poor of sending female children out to work as domestics, the fact that these two girls were listed with an occupation does not necessarily mean they were no longer considered children (Barber 1991).

Table 6.2. Data from the 1860 census of the City of Dubuque, showing the number of teenagers, divided by age and sex. The adolescent population is further divided by place of residence and whether or not an occupation is listed in the records. (Home=individual living in parental home or with immediate family of same surname; Away=individual living with family of different surname, in boarding house, or in own household).

Age	Female-Home-No occ.	Female-Home-Occ.	Female-Away- No occ.	Female-Away-Occ.	Male-Home-No occ.	Male-Home-Occ.	Male-Away- No occ.	Male-Away-Occ.
12	105	0	18	2	117	1	8	0
13	93	0	15	12	81	0	9	1
14	93	0	19	12	82	0	11	2
15	91	2	22	18	75	8	5	4
16	79	2	25	36	57	39	6	9
17	67	5	24	37	34	45	3	16
18	79	4	28	45	19	55	3	21
19	65	6	33	29	10	45	0	23
TOTAL:	672	19	184	191	475	193	45	76

By the age of 13 to 14, males were still primarily living at home and only 1.6% (3/186) were listed with an occupation. By contrast, nearly 10% of girls 13 to 14 years old (24/244) were living away from home and working, with 23 recorded as servants and one as a nun. The listing of a 13-year-old as one of the Sisters of Charity may have been an error. However, if correct, it implies that a female of that age was considered sufficiently mature to make such a decision (or to have it made on her behalf). Regardless, it is clear that at the age of 13 to 14, more females were beginning the transition to adulthood than males.

At the age of 15, the proportion of boys with occupations almost equals that of girls. Over 13% (12/92) of boys were listed with some type of profession, while 15% (20/130) of girls were listed as servants. The majority of males with jobs still lived at home, while nearly all of the girls lived with the families they served. An important transition happened for males at the age of 16, however, when the percentage with an occupation listed in the census jumps to almost 43% (48/111). In many cases, this leap may not reflect a change in daily labour as much as a change in status within the family business, from child-helper to trained tradesman. The money generated by labour outside the home customarily went to the father rather than to the worker himself, though, which demonstrates that adult status was not reached until the age of majority (Riney-Kehrberg 2000:121; Syrett 2015:112). Girls saw a more modest increase in employment as servants at the age of 16, up to 27% (38/142).

From the age of 17 onward, more males were working than not (Table 6.3). Though these years saw an increase in the number of men moving away, the majority of those listed in the city census continued to reside at home.[2] Female 17-year-olds experienced only a small increase in employment, but from this age up enjoyed occupations other than domestic service; they were seamstresses, dressmakers, milliners, and schoolteachers. This is also the age at which two newly married women established their own households, an apparent rarity. Only six 18-year-olds presided over a household, but such a position became more commonplace by the age of 19. Fourteen women of this age lived independently with their husbands. It should be noted, however, that the husbands in these instances were all 20 years or older.

Table 6.3. Percentages of teenagers, divided by age and sex, listed as having an occupation in the 1860 census of the City of Dubuque. Female figures include wives in charge of their own households, in addition to standard professions.

Age	% of Females with Occupation	% of Males with Occupation
12	1.6	0.8
13	10.0	1.1
14	9.7	2.1
15	15.0	13.0
16	26.8	43.2
17	33.8	62.2
18	35.3	77.6
19	36.8	83.3

2 The disparity in the size of the male and female adolescent populations in the city's census records is likely due to young men being sent out of town for school, apprenticeship, or work, thus leaving the Dubuque census with a deceptively high proportion of male teenagers living at home. Evidence for this is seen in the 1860 totals for Iowa, which report nearly equal numbers of males and females aged 10 to 20 years (Kennedy 1864:134).

6.3. Biographical Accounts of Adolescents in Dubuque

Data collected from official records roughly aligns with details found in local biographies that give attention to the teenage years. The brief biographical sketches in Oldt's history of Dubuque County include seventy-seven narratives which mention the adolescent years of male residents between 1850 and 1880. Of these individuals, the largest number left school at the age of 13 (thirteen boys) or 14 (sixteen boys), though attendance up to the age of 15 or 16 was not uncommon. Few of the biographical subjects left school at 17 or older, and many of those attended business college or a seminary. Writing in 1911, Oldt clearly felt it was a hardship to end one's education at the age of 12, and most of the cases mentioned involve dire circumstances. Despite the lack of recognition in census records, there is ample evidence in Oldt's text that 13- and 14-year-old boys were engaged in work, sometimes as formal apprentices. At 13, Christian Voelker became a chairmaker's apprentice, and George Healys learned the agricultural hardware and seed business. George Schmid went to Ohio at 14 to learn cabinet-making, while Frank Kutsch was apprenticed to the foreman of a sheet metal factory. Fourteen-year-old Jacob Haudenshield trained as a carpenter in the warm months and a butcher in the winters. The low number of occupation listings for males of this age in the census appears to be a reflection of how they were regarded, as boys in training rather than employed youths. Though Oldt's sketches focus exclusively on prominent businessmen and farmers, given the variety of their backgrounds (both native and foreign-born; poor, middle-class, and wealthy), the sample does not appear overly biased (Oldt 1911:497-870).

A more complete autobiography recounts the childhood and adolescence of Rufus Rittenhouse (1880), whose cash-poor family homesteaded in the countryside outside the city of Dubuque. Rittenhouse's education was suspended at the age of 10, when the family emigrated to Iowa from New Jersey, and his only contact with other teens seems to have been at biweekly religious meetings and occasional revivals. He felt that his fine appearance in his dead father's brass-buttoned coat set him above his peers at these events, but the rest of his life was endless drudgery. From the age of 13, in 1838, his labour was shared with neighbours as repayment for favours to his family and his stepfather's debts. Though he attempted to earn his own money by cutting hay and growing onion seed over the next few years, payment was given directly to his mother or, in one case, simply seized by his stepfather. He was finally permitted to leave the family home to work as a mason's assistant in the city of Dubuque at 17, only because his mother convinced her husband that her younger son (age nine) would soon be able to take on Rufus's duties. Apprenticeship with the mason brought greater freedom, but not true independence. He was apparently not paid for his work (except in room and board), though he was permitted to earn money for himself by cutting wood in his spare time. When he recklessly test-fired a new rifle towards some houses in town, the neighbours complained to the mason, rather than hunting down the young man himself. Around the age of 19, Rittenhouse was "sent home to die of consumption." Having survived his grave illness, he returned to his employer, and then began working as an independent contractor the following year, at twenty. His narrative of *Boyhood Life* ends at that age (Rittenhouse 1880).

The memoirs of Josiah Conzett (1900) describe adolescence in the city of Dubuque a decade later. As an older child, Conzett attended school but also gleaned lead from the backdirt of the mines to help support his family, as they struggled financially due to his father's recurring bouts of malaria. In 1855, at the age of 14, he left school to work full-time as an errand boy at a general store, where the owner provided lodgings and served, to some extent, as a chaperone. Living in the city afforded ample opportunities for recreation, and Conzett recalls attending a circus, performing acrobatic feats, swimming, playing pranks on his friends (often involving rifles), and donning a pair of fashionably tight trousers to witness a public hanging. When he became seriously ill at 15, Conzett was sent back home, and after his recovery several weeks later, his parents enrolled him in the Presbyterian College. Uninterested in a career as a preacher, he dropped out after one term, and was subsequently expelled from his family's home. He returned to his former employer, who provided lodging for him at a boarding house, but continued to contribute to his family's economy by furnishing goods from the store. He was promoted to a clerkship at 16, and shortly after his 20th birthday, he enlisted in the Union Army and fought in the Civil War. Meanwhile, his sweetheart Nellie, four years his junior, was "living out," at an unspecified location, due to mutual antagonism with her stepmother. Conzett married Nellie immediately upon his return to Dubuque when he was 24 and she was 20. They lived with family for two years before establishing their own home.

Though Peter Hoffman's (1936) recollections of Dubuque are more concerned with the history of the town than his own biography, he provides some glimpses into his adolescent period. The son of a middle-class tradesman, Hoffman received First Holy Communion at the age of 12 and left Catholic school in 1868 at the age of 13. He obtained a job as a bell boy through the connections of a family friend, but, finding the work unpleasant, he quit by sneaking out at the end of the first day. He is listed on the 1870 Census as a 15-year-old with no occupation, and other than his one-day stint at the hotel, it does not appear that he was employed during his youth. He writes about swimming in the slough, the Mississippi River, and even in the aisles of a lumberyard during a flood, and comments on the many drownings – and narrow escapes – that occurred. Ice skating at the harbour rink was a common amusement, though bolder youths chose to skate on the river. Stage plays, minstrels, and concerts also provided entertainment for his peer group. Hoffman mentions that in the 1870s, the city enacted a curfew law which forbade individuals under the age of 13 from being out in the street after nine o'clock. He gives no explanation for the short-lived ordinance, but it is interesting that teenagers were not included in the curfew, presumably because of the understanding that employed teens might have legitimate business in town at night.

Only one autobiography offers a glimpse into the lives of adolescent girls in the region, that of Clarissa Gear Hobbs (1974). Clarissa grew up in Galena, Illinois, another lead mining town across the Mississippi River from Dubuque. When her mother died in 1835, Clarissa's 16-year-old sister, Maria, took over part of the maternal role and cared for the youngest child of the family for nearly two years, until she was finally sent to high school in Philadelphia. Clarissa herself was taught in the home by relatives until 1843, when she was sent away to an Episcopal school in Tennessee from the ages of 14 to 17. She considered herself quite grown up when she returned home from school, but her memoir recalls dancing and boating with other young people in her social circle and riding her pony up a nearly vertical slope on a dare. Clarissa was struck with cholera within a year or two of her return to Galena but survived. Later, around the age of twenty-one, she married the doctor who treated her.

6.4. Interpretations of Adolescent Status

From the official records and biographical vignettes presented above, it is clear that nineteenth-century adolescence was an ill-defined period of transition, rather than a distinct developmental stage, as it is viewed today. The timing of its onset was influenced by a number of factors including the size and nature of the community, the socioeconomic status of the family, and the sex of the individual. The marriages of 14-year-old girls in the pioneer days of Dubuque point to a brief adolescence that was extended as the community grew and urbanized.[3] The practice of impoverished families sending their 13- and 14-year-old girls away as servants forced on them adult-like responsibilities not experienced by the sons and daughters of middle-class and wealthy families (Mintz 2004:75-76). In general, however, females seemed to reach the transitional stage of adolescence at a younger age than males, likely coinciding with the onset of menarche, which occurred as early as 13 or 14 years (*Medical News* 1901), and visible physical changes. Based on occupation listings and school attendance, it appears males began the passage towards adulthood at around 15 years, the age at which the Census Office first required that occupation be recorded. The perception of 14 as the end of true childhood for males is also implied in nineteenth century criminal codes, as individuals above this age were tried as adults for serious crimes and could be "bounded out" as involuntary apprentices if found to be vagrant (Gittens 1994:91-92; Landrum 2015:127; Schmidt 2015:155-156).

Though females were empowered to marry without consent – and hold property – at the age of 18, the low numbers of such women who established their own households suggests they had not quite attained the status of adulthood. Girls of 18 or even 19 were still attending some type of school. However, more than a dozen 19-year-old women ran their own households. The youngest recorded nuns in Dubuque (aside from the perhaps mistakenly recorded 13-year-old) were also 19,

3 This early period is of less relevance to the present study, as the majority of graves were excavated from the portion the cemetery used after ca. 1856.

indicating that women this age were entrusted with adult decisions. The range of ages, then, which might be considered a transitional period for females in nineteenth-century Dubuque is 13 to 18 years. Males, who began the transition a little later, also achieved adulthood later. Though the legal age of majority was twenty-one, some men married at twenty and established their own households or even started their own businesses, like Rufus Rittenhouse. The range that might be regarded as adolescence for males, then, is 15 to 19 years. For greater detail regarding the adolescent experience in Dubuque and the Midwest, see Mack and Clarke (2020).

6.5. Social vs. Biological Adolescence

The ranges of social adolescence for males and females in nineteenth-century Dubuque overlap with one another and fall within the range of biological adolescence observable from the eruption of second molars and fusion of long bone epiphyses (Figure 6.8). The earlier occurrence of social adolescence in females is mirrored skeletally. On average, the major long bone and pelvic epiphyses commence fusion around two years earlier in females than in males, and fusion is complete one to three years earlier in females (Schaefer *et al.* 2009).

Unfortunately, sex could not be determined for all the adolescent skeletons in this study, which hampers the determination of social adolescence for some individuals. In well-preserved skeletons, evaluation of pubertal markers can substitute for age and sex assessments, as any individual in the deceleration phase of puberty—post-menarche for females, after voice change for males—likely fell within the range of social adolescence in Dubuque (Lewis *et al.* 2016). In the absence of precise age and sex information, it must be remembered that a dentally-determined 13- to 14-year-old from Third Street might be a male child or a female adolescent, while an 18- to 20-year-old might be an adolescent boy or an adult woman.

The importance of classifying individuals as social adolescents is obvious for the portion of this study devoted to mortuary treatment, as funerary rites and the associated material culture are influenced by the social identity of the deceased and how he or she was regarded by the principal mourners. The defining of social adolescence is also crucial for the study of health and mortality in this population. Biological changes associated with puberty, which have the potential to increase disease susceptibility, can commence and end outside the range social adolescence. However, these internal factors are not the only changes affecting adolescent well-being. Liberation from childhood dependence on family for nutritional needs had the potential to improve an adolescent's health, but the increased exposure to communicable diseases due to a widening circle of social interaction and increased exposure to physical hazards through work and recreation potentially constituted a significant portion of mortality risk for teenagers.

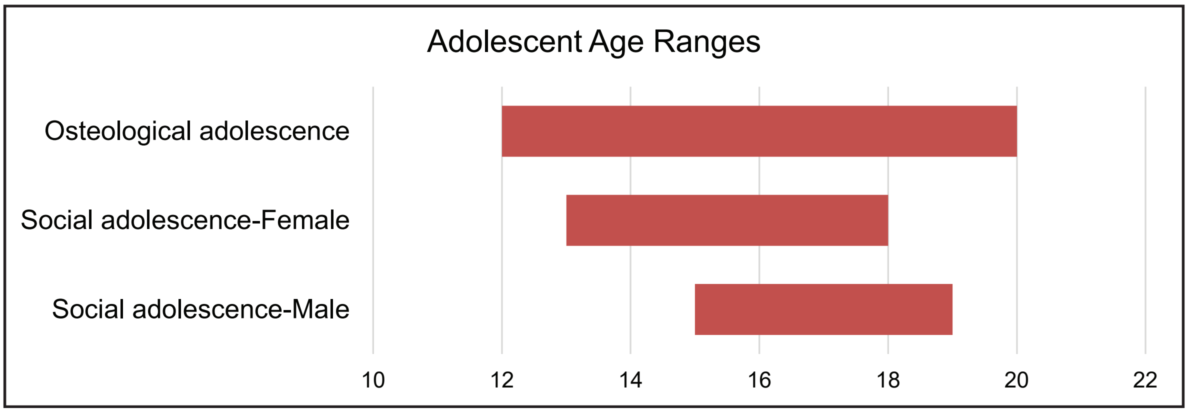

Figure 6.8. Graph demonstrating the range in years of osteological adolescence (both sexes) and social adolescence for females and males (osteological adolescence data adapted from Schaefer et al. 2009:354-355).

Chapter 7

Bioarchaeology, Palaeopathology, and Adolescent Mortality Trends in Dubuque and the Third Street Cemetery

7.1. Introduction

In order to investigate mortality trends for adolescents, as well as the rest of the population, from the Third Street Cemetery and the City of Dubuque, evidence was drawn from both historical documents and the excavated skeletal materials. In this chapter, documentary evidence is presented first, followed by data from the osteological analyses. Finally, a predictive model for skeletally observable pathology in adolescents is proposed based on the historic records and findings from the Third Street collection.

7.2. Historical Death Records and Adolescent Mortality in Dubuque

Though use of the Third Street Cemetery predates the systematic recording of deaths by state and local governments in Iowa (Mack 2013a:38), numerous contemporary sources are available which provide information about individual deaths during this period in Dubuque. Some records relate to the Catholic cemetery, while others document deaths in the community at large. The greatest volume of information comes from the burial records of the nondenominational Dubuque City Cemetery. In the sections below, data from the various sources – as well as their short-comings – are examined.

7.2.1. HISTORIC DOCUMENTATION OF THE THIRD STREET CEMETERY, 1839-1880

As discussed in Chapter 3 (Section 3.5), the burial records for the Third Street Cemetery (Phoenix Project 2005) cover only a third of its use period, are incomplete within those years, and rarely give cause of death. As funerals were not consistently recorded, entries were more likely to involve prominent church members' families or unusual circumstances, such as groups of newcomers who died of cholera. During the original cemetery research project, these burial records were supplemented with obituaries and tombstone fragments, which generally represent wealthier individuals, and local newspaper articles, which often concern deaths from accidents and violent causes. These types of records constitute non-random samples, but they were consulted nonetheless, as they are the only documentary sources of information pertaining to individuals who may be present in the Third Street sample.

Of the 726 individuals listed in the Burial Register of St. Raphael's Cathedral and the eight additional deaths recorded in the day book of Bishop Loras, 579 could be assigned to a general age class. The age proportions of the sample recorded in these burial records is similar to that of the excavated sample, while the 194 deaths recorded in obituaries, tombstone epitaphs, and newspaper articles are skewed heavily in favour of adults (Table 7.1). For these calculations, the overlapping age ranges utilised during osteological analysis (Buikstra and Ubelaker 1994:9) were adjusted, both to accommodate the precise age information available in the historic records and to better reflect the age of social adolescence in the community. Age classes used for comparisons using historic documents are as follows: infant, 0 to 3 years; child, 4 to 12 years; adolescent, 13 to 19 years; adult, 20 years or older. As the sexes were pooled for these calculations, the full range for social adolescence was used, rather than the separate ranges for females (13-18 years) and males (15-19 years).

Table 7.1. Percentages of individuals of different age classes represented in three samples from the Third Street Cemetery: the excavated skeletal sample, individuals listed in the cathedral burial records, and individuals from sources such as obituaries, newspaper articles, and grave marker epitaphs.

Age Class	Excavated skeletal sample (1833-1880)	Cathedral burial records (1839-1856)	Obituaries, articles, epitaphs, etc.
Infant (0-3 yrs)	44.7	39.9	10.3
Child (4-12 yrs)	8.5	12.3	5.2
Adolescent (13-19 yrs)	4.9	4.3	6.7
Adult (20+ yrs)	41.9	43.5	77.8

Of the 579 individuals of known age from the cathedral burial records, only 20 are listed with cause of death, none of them teenagers. Sixty-four of the 194 individuals known from other sources have death information provided, including five of the 13 adolescents. One young man drowned, and another fell down a mine shaft. Two young women died of typhoid fever and "long illness," respectively. The last teenager, 16-year-old John Doyle, was originally reported to have died of cholera on a riverboat; later reports claimed he died from a bout of over-eating and the resulting fever (Lillie and Mack 2013:780).

7.2.2. MORTALITY SCHEDULES FROM THE U.S. CENSUS, 1850-1880

During the four enumerations between 1850 and 1880, the U.S. Census Bureau collected data, including age at death and cause of death, concerning residents who had died in the preceding 12 months. The individuals listed in the Mortality Schedules for the City of Dubuque include Catholics (buried at Third Street and elsewhere) and non-Catholic residents of Dubuque. In 1850, 124 deaths were reported to the U.S. Census, while 84 were reported in 1860, 209 in 1870, and 138 in 1880. The proportions by age class are presented in Table 7.2, along with the pooled data of all 555 deceased Dubuquers. The numbers of the dead by enumeration year are not representative of the steadily growing population of the living, and may reflect actual variations in death rates. The high proportion of children who died between 1859 and 1860, for instance, was due to an outbreak of scarlet fever which took the lives of eight of the 17 children reported. Alternatively, the unexpected dips in the number of dead listed in the Mortality Schedules for 1860 and 1880 may simply reflect the inaccuracies resulting from self-reporting. The aggregate data, however, show age class proportions almost identical to those determined for the skeletal sample from the Third Street Cemetery (see Table 7.1).

Table 7.2. Percentages of different age classes reported in the U.S. Census Mortality Schedules for 1850-1880, with the age distribution for all 555 individuals reported in the four enumerations presented in the Pooled Data column.

Age Class	1850	1860	1870	1880	Pooled Data
Infant	50.0	38.1	51.2	36.3	45.2
Child	8.9	20.2	4.8	6.5	8.5
Adolescent	2.4	4.8	5.7	6.5	5.0
Adult	38.7	36.9	38.3	50.7	41.3

Cause of death is listed for all 26 adolescents recorded in the Mortality Schedules for Dubuque. Consumption (pulmonary TB) is the most common cause listed, with 11 reported cases. A case of Pott's disease (spinal TB) and two probable TB cases, listed as "spinal disease" and "hip disease," bring the number of deaths due to TB to 14, accounting for more than 50% of the recorded adolescents. Other common causes of death are drowning (3/26), typhoid fever (3/26), and meningitis (2/26). The remaining four adolescents died from diarrhoea, gastroenteritis, inflammation of the lungs (bronchitis), and lung fever (pneumonia) (Table 7.3). The prevalence of reported adolescent deaths due to external causes is 115 per 1,000 versus 885 due to medical causes per 1,000 deaths.

Table 7.3. Number and percentage of adolescent deaths by cause. Data compiled from the Mortality Schedules of the City of Dubuque, 1850-1880.

	Tuberculosis	Drowning	Typhoid	Meningitis	Other causes
# of deaths	14	3	3	2	4
% of total	53.9	11.5	11.5	7.7	15.4

7.2.3. DUBUQUE CITY CEMETERY RECORDS, 1855-1875

Neither the incomplete cathedral records and biased newspaper records nor the four years of Mortality Schedules provide a dataset comparable to the Third Street Cemetery population, which accumulated over the course of more than 45 years. However, the majority of the excavated graves (approximately 85% or 790/939) appear to have been located within the later addition to the Third Street Cemetery, which was used from around 1856 to 1880. Burial records from Dubuque's nondenominational City Cemetery span a comparable period, 1855 to 1875, and include over 3,000 entries, 2,752 of which specify both age and cause of death. Though these entries only record the deaths of individuals who were *not* buried in the Third Street Cemetery, the data provide details about the lives and deaths of an analogous subset of the same larger community (i.e., non-Catholics). The correspondence between the two burial populations in Dubuque – Catholic versus non-Catholic – is demonstrated by the similarities in age class profiles (Table 7.4).

Table 7.4. Age class profiles from the Third Street Cemetery (excavated skeletal collection and cathedral records) and the City Cemetery (burial records), showing both the number and percentage of deceased individuals for each age group.

Age Class	3rd Street, excavated sample (1833-1880)		Cathedral burial records (1839-1856)		City Cemetery burial records (1855-1875)	
	#	%	#	%	#	%
Infant (0-3 yr)	395	44.7	231	39.9	1425	47.4
Child (4-12 yr)	75	8.5	71	12.3	322	10.7
Adolescent (13-19 yr)	43	4.9	25	4.3	124	4.1
Adult (20+ yr)	370	41.9	252	43.5	1137	37.8
Total:	883	100	579	100	3008	100

In addition to providing data for a cumulative burial population similar to that of Third Street, the size of the City Cemetery sample allows for a one-year "snapshot" comparison with the living population and the self-reported death data. Table 7.5 presents data from the 1860 Federal Census of the City of Dubuque, the 1860 Mortality Schedule, which documented deaths in the 12 months leading up to the census date of June 1, and the City Cemetery burial records covering the same 12-month period. By examining the data from a one-year period, it is possible to avoid the problems of demographic non-stationarity which hinder attempts to project death rates and mortality trends exclusively using osteological data from a cumulative burial population.

Table 7.5. Age class profiles of the City of Dubuque from the 1860 Census records, 1860 Mortality Schedule, and City Cemetery burial records, showing both the number and percentage of individuals for each age group.

Age Class	1860 Census, City of Dubuque (living population)		1860 Mortality Schedule, City of Dubuque		City Cemetery burial records, June 1, 1859-May 31, 1860	
	#	%	#	%	#	%
Infant (0-3 yr)	2000	15.4	32	38.1	66	48.2
Child (4-12 yr)	2821	21.7	17	20.2	18	13.1
Adolescent (13-19 yr)	1604	12.3	4	4.8	8	5.8
Adult (20+ yr)	6573	50.6	31	36.9	45	32.9
Total:	12998	100	84	100	137	100

A striking lack of correspondence exists between the self-reported recollections of family deaths and the official records of physical burials. To some extent that disparity in numbers could be explained by the fact that some residents who lived outside the city limits were buried in the City Cemetery but not recorded on the city pages of the Mortality Schedule. However, the lack of correspondence goes beyond mere numbers; of the 35 names entered on the first page of the Mortality Schedule, only eight appear in the City Cemetery records for the purported time period. This discrepancy is not unexpected, as documents suggest approximately three-quarters of Dubuque's population was Catholic in 1860 (Mack 2013d:86), and therefore would have been buried at Third Street or the other two Catholic graveyards. Based on the religious affiliations of the population, the City Cemetery records should represent approximately one quarter of the deaths in Dubuque in any given year. As the 1860 Mortality Schedule recorded far fewer deaths than the City Cemetery records list (rather than the expected 300% more), it appears the self-reported death data do not provide an accurate representation of mortality trends in Dubuque.

The 1860 City Cemetery records do not correspond as well with the age profile of the skeletal sample from the Third Street Cemetery as do the cumulative records from the City Cemetery (Table 7.4). The larger percentage of adults at Third Street perhaps relates to the adult-dominated population of Dubuque from 1833-1845, when lead mining was the primary industry (Mack 2013b:68). Additionally, the previously mentioned spike in children's deaths in the 1860 Mortality Schedule is mirrored in the City Cemetery records for the same period, due to the outbreak of scarlet fever. In fact, the period of 1859 and 1860 saw 42% (38/92) of all the infant/child deaths from scarlet fever in 20 years of City Cemetery records.

Based on comparisons with other Dubuque death records, and given the regulated manner in which the City Cemetery data were compiled, these burial records appear to provide the most reliable information available concerning mortality in nineteenth-century Dubuque. Using the 1860 Federal Census data and taking into account the religious structure of the community and the usage of the City Cemetery, it is possible to extrapolate age-specific death rates for the non-Catholics of Dubuque. The number of individuals in a given age class in the 1860 Census (n) is multiplied by one-fourth to represent the non-Catholic portion of the community. To this number is added the number of burials recorded in the City Cemetery in 1859-1860 for that age class (b), in order to calculate the total non-Catholic population for that age class on May 31, 1859 (p). The death rate for the age class is calculated by dividing the number of burials (b) by the population (p) and multiplying by 1,000 (Buescher 2010).

$$(n \times 0.25) + b = p$$

$$(b/p) \times 1{,}000 = \text{death rate}$$

For example, the death rate for infants among non-Catholics in Dubuque in 1860 is calculated as:

$$(2000 \times 0.25) + 66 = 566$$

$$(66/566) \times 1{,}000 = 116.6$$

The death rates by age class are presented in Table 7.6. From these numbers, it is clear that infant mortality was high in Dubuque in 1860. The large number of infant graves found in the Third Street Cemetery, then, is representative of this mortality rather than a massive increase in fertility over time, thus confirming the assumption of strong selective mortality for this population. This finding is expected in an American urban area during the time period. More interesting is the death rate for adolescents, which is not significantly lower than that of children and adults ($\chi^2=0.679$, df=2, $p=0.712$). This calculated death rate suggests that in 1860, adolescents were only slightly less likely to die than, for instance, their parents and younger siblings. Their low representation in the skeletal sample from the Third Street Cemetery, then, is a reflection of the small size of the living adolescent population, which, in turn, was a result both of the short span assigned to the age class and, perhaps, the tendency for male teenagers from Dubuque to leave the city for work or training (as noted in Chapter 6).

Table 7.6. Death rate per 1,000, by age class, for the City of Dubuque, 1859-1860. Data calculated using the 1860 Census and City Cemetery burial records.

Age Class	Approx. non-Catholic population May 1859	# of City Cemetery burials 1859-1860	Death rate per 1,000 (rounded)
Infant (0-3 yr)	566	66	117
Child (4-12 yr)	723	18	25
Adolescent (13-19 yr)	409	8	20
Adult (20+ yr)	1,688	45	27
Total population:	3,386	137	40

7.2.4. ADOLESCENT CAUSE OF DEATH, DUBUQUE CITY CEMETERY

Of the 123 adolescents listed in the City Cemetery records with cause of death, one committed suicide, 23 died of accidental causes, and the remaining 99 were killed by disease. Almost 30 different medical causes were noted in the records (Table 7.7), with most diseases responsible for only one or two deaths. Given the somewhat primitive state of medical care in the nineteenth century, it is possible that some causes of death were misidentified in these records. However, the commonly occurring diseases lend themselves to consistent diagnosis. Just as seen in the Mortality Schedules, the most frequent causes were TB (n=35), accidents (n=23), typhoid fever (n=14), and meningitis (n=10), together accounting for two-thirds of adolescent deaths in the City Cemetery.

Table 7.7. Disease-related and external causes of death listed for adolescents in the Dubuque City Cemetery burial records, 1855-1875.

Disease:	# of adolescent deaths	% of adolescent deaths
Tuberculosis (consumption, scrofula)	35	28.5
Typhoid fever	14	11.4
Meningitis (brain fever, inflammation of the brain, inflammation of the spine)	10	8.1
Heart disease	4	3.3
Pneumonia (lung fever)	4	3.3
Dysentery (bloody flux)	3	2.5
Seizures/epilepsy (fits, spasms)	3	2.5
Bronchitis (inflammation of the lungs)	3	2.5
Enteritis (inflammation of the bowel)	2	1.6
Fever	2	1.6
Paralysis	2	1.6
Stroke (apoplexy)	1	0.8
Bilious fever	1	0.8
Cholera	1	0.8
Congestion of the blood	1	0.8
Congestion of the brain	1	0.8
Diabetes	1	0.8
Dyspepsia	1	0.8
Dropsy	1	0.8
Inflammation	1	0.8
Malaria (intermittent fever)	1	0.8
Measles	1	0.8
Nervous fever (sometimes typhoid)	1	0.8
Peritonsillar abscess (quinsy)	1	0.8
Rheumatism	1	0.8
Small pox	1	0.8
St. Vitus dance	1	0.8
Whooping cough	1	0.8
External causes:		
Accidental drowning	14	11.4
Accident, unspecified	5	4.1
Accident, shooting	2	1.6
Accident, fall	1	0.8
Accident, struck by train	1	0.8
Suicide, shooting	1	0.8
Total adolescent deaths:	123	100

Though the other age classes also experienced high numbers of deaths from some of these top four causes, there are significant differences in the mortality profiles. Figure 7.1 presents the prevalence rate per 1,000 for these four causes of death, divided by age class. The results clearly demonstrate the effects of age-specific susceptibility, as well as proportional mortality. The high prevalence of TB in teenagers (284.5 per 1,000) is likely due to the tendency for secondary TB to emerge in adolescence (Lewis 2018a:155). The lower rate seen in infants (28.6 per 1,000) has two likely explanations. Quick-killing primary TB in the very young is not as recognisable as the chronic form that affects adolescents and adults, so many of these deaths may have been misreported. Additionally, infants buried in the City Cemetery died at high rates from other conditions – ones which did not affect adolescents – leaving fewer individuals to perish from TB. Out of the 1,295 infants listed, 170 died of simple diarrhoea, with a prevalence rate per 1,000 of 131.3. Though it is tempting to propose that adolescents were more likely to contract typhoid fever, or more likely to perish from it, a chi-square test of independence found that the difference in prevalence rates between children, adolescents, and adults did not reach the level of significance ($\chi^2=5.235$, df=2, p=0.073). The relatively high rate of adolescent death from typhoid fever (113.8 per 1,000) appears related to proportional mortality. Adults were dying from a wider variety of causes, many of which did not generally affect adolescents, such as cancer, childbirth and complications, old age and debility, and heart disease. Meanwhile, child mortality was greatly affected by scarlet fever (135.3 per 1,000) as well as meningitis, which was found to be a significantly more common cause of death for this age group ($\chi^2=81.869$, df=3, p=0.000).

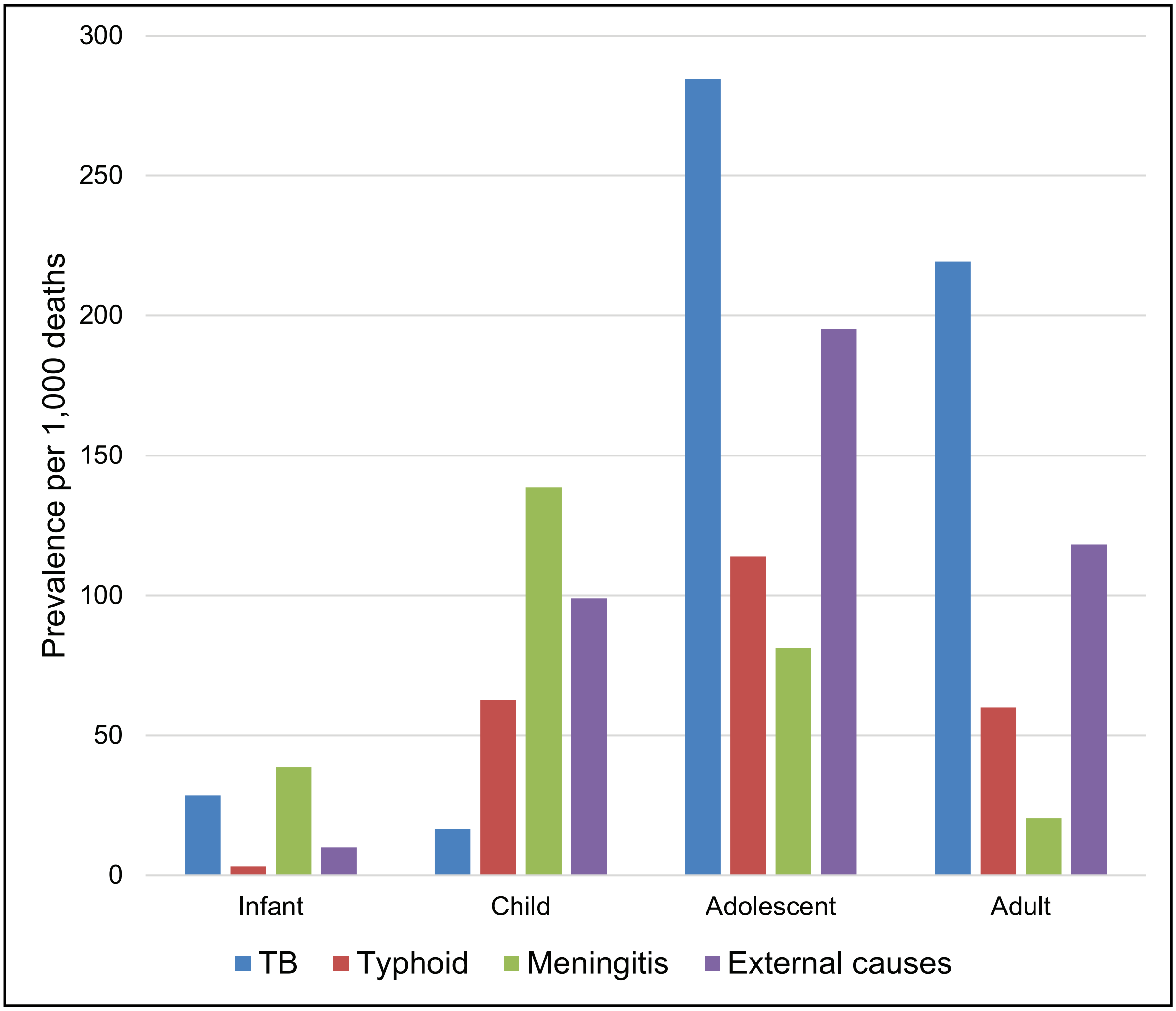

Figure 7.1. Graph showing the prevalence per 1,000 deaths of the top four causes of death, divided by age class. Data taken from the Dubuque City Cemetery records.

Sex and Chronic Disease Among Adolescents

Different age groups clearly experienced varying levels of risk for specific fatal diseases, and it is reasonable to expect sex bias, as well. For adults, certainly, there are causes of death which are sex-specific, such as childbirth complications and puerperal fever. For adolescents buried in the City Cemetery, though, few sex differences were observed in the relatively small sample. The numbers of adolescent males and females who died from the top three medical causes of death (and two additional chronic diseases) are presented in Table 7.8.

Table 7.8. Numbers of City Cemetery adolescents who died from various chronic diseases, divided by sex.

Sex	TB	Typhoid	Meningitis	Pneumonia	Bronchitis
Male	14	7	4	3	1
Female	21	7	6	1	2
Total:	35	14	10	4	3

The only disease for which a significant sex bias was observed is TB. Teenage girls died at a rate of 3:2 when compared with adolescent boys. Without more detailed medical records, it is impossible to know whether females in Dubuque were more likely than males to develop chronic secondary TB or were more likely to die from the disease once contracted. Though men in rural areas may have come into close contact with more people and livestock than rural women did, exposure was likely comparable for both sexes in an urban centre like Dubuque. Twentieth-century studies found that adolescent and young adult women were more often affected by TB than their male counterparts, possibly due to the onset of menses and the increased demand for proteins. Nevertheless, the stronger immune response observed in females should result in lower TB mortality for young women, despite a higher rate of infection (Roberts and Buikstra 2003:46-47). In a study of medieval skeletons, Shapland *et al.* (2015) found that more females aged 14 to 25 years exhibited evidence of TB than males of the same age. In the Dubuque records, however, the apparent sex bias in this relatively common cause of death could be a function of the uneven sex ratio in the sample population, which, in 1860, included 941 girls and only 663 boys between the ages of 13 and 19.

External Causes of Death

Though adolescents at the City Cemetery were not found to be statistically more likely than other age groups to die from the top three medical causes of death, they appear to have been more vulnerable to accidental/violent deaths. Eliminating infants, whose low numbers indicate the expected lack of exposure to violence and accidents, a chi-square test of independence demonstrates that adolescents were significantly more likely to die from external causes than children and adults (χ^2=7.811, df=3, p=0.020). A breakdown of specific causes, with number of individuals and prevalence per 1,000, is presented in Table 7.9.

Table 7.9. Number of individuals and prevalence per 1,000 for three external cause of death categories, divided by age class. Data derived from Dubuque City Cemetery burial records, 1855-1875.

Age Class (# of individuals)	Accident #/prevalence per 1,000	Homicide #/prevalence per 1,000	Suicide #/prevalence per 1,000	All external causes, #/prev. per 1,000
Child, 4-12 yr (n=303)	30/99	0/0	0/0	30/99
Adolescent, 13-19 yr (n=123)	23/187	0/0	1/8	24/195
Adult, 20+ yr (n=1,031)	98/95	6/5.8	12/11.6	122/118*

Unlike the adult population, adolescents in Dubuque were not victims of homicide, and only one 17-year-old buried in the City Cemetery committed suicide during this 20-year period. However, teenagers died from accidents at higher rates than both children and adults. This high rate may, again, be related to proportional mortality. If relatively fewer adolescents were dying from the diseases that afflict the very young and the very old, those deaths which occurred had to be related to other factors. Without more specific information concerning each death, it is impossible to determine all the relevant risk factors. A breakdown by sex, age, and accident type can offer a more detailed picture of causative factors.

Few females of any age died of accidental causes. Of the 28 children with sex given in the records, only three were girls. Only one of the 23 adolescents who died in accidents was female and only six of the 97 adults of known sex. Given the sex bias in occupational status from the age of 16 years onward (demonstrated in Chapter 6) it seems likely that one of the primary risk factors for adolescents was their entry into the workforce, generally in the lowest level – and thus potentially hazardous – positions, as found in other studies (Murphy *et al.* 2019; Penny-Mason and Gowland 2014:165).

If employment were the greatest risk factor for accidental death among adolescents, the number of teenagers dying would be expected to increase with each year of age,

* This figure incorporates six deaths from external causes that do not fit into the three given categories, including three Civil War casualties, one morphine overdose, and two individuals who “died in jail.”

as the employed portion of the adolescent population increased. No such pattern is found among the entries for the City Cemetery (Figure 7.2). Boys who had reached biological adolescence but had not yet attained social adolescence (13- and 14-year-olds) experienced accident-related mortality in the same numbers as older teens. The lack of specific age-related patterning may be due to the small sample size, but the sex-related bias, regardless of cause, indicates that adolescent females had substantially lower risk of serious accidents in daily life.

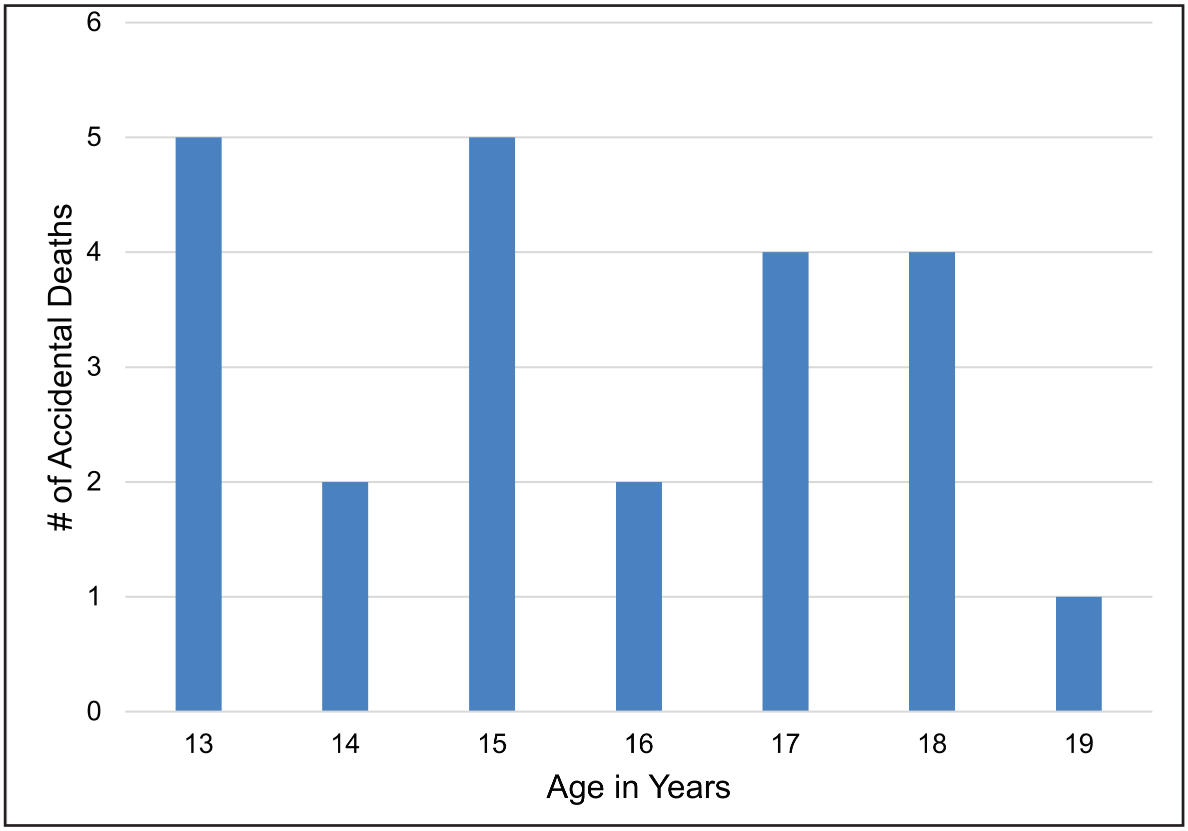

Figure 7.2. Number of accidental deaths among the adolescents in the Dubuque City Cemetery records (1855-1875), divided by year of age.

Of the accidents listed in the City Cemetery records without specified type, newspaper accounts could only be found for two. Eighteen-year-old B. Pragatz accidentally shot himself in the face while duck hunting (*Dubuque Daily Herald* [*DDH*]1866), and Theodore Bilasch, 13, was run over by a train when he rolled onto the tracks while wrestling with another boy (*DDH* 1871). Francis C. Walker, 16, also accidentally shot himself, but further details are not provided in the cemetery records. None of these three deaths can be considered work-related, though 18-year-old Joseph Bayles' "death by fall" could have occurred on a job site. The circumstances of the remaining five unspecified accidents are unknown.

The remainder of the accidental adolescent deaths (14/123 burials) were due to drowning. A chi-square test of independence found that adolescents in the City Cemetery drowned at a significantly higher rate than children (19/303) and adults (5/1,031) (χ^2=17.968, df=2, p=0.000). This finding is not surprising given the attraction of water for recreation and the large bodies of water in the Dubuque area. Adolescent males in this era considered swimming an essential part of their social lives, with horseplay an expression of independence and rebellion (Riney-Kehrberg 2014:68-69). In nineteenth-century Philadelphia, the majority of drownings were related to leisure, with men between the ages of 15 and 35 making up most of the cases (Lane 1979:48-49). However, drowning was not always associated with recreation and recklessness. The economy of Dubuque provided numerous jobs on the Mississippi River. The 1860 Census shows that adolescent boys were employed both as boatmen and fisherman. Those listed as day labourers may have worked seasonally as ice cutters or as lumbermen, pulling pine logs floated down from Wisconsin out of the river. Until the construction of a railway bridge (begun in 1867), Dubuquers crossed the river to do business in Dunleith by boat or over the ice in the winter (Ingersoll and Mack 2013:25). Young men listed as carriage drivers, stage drivers, and teamsters may have made these treacherous winter journeys, and it was not unheard of for people crossing the river on foot or by other transport to fall through the ice and drown (*Dubuque Herald* 1863a, b).

Details could not be found for all 14 adolescent drownings listed in the City Cemetery records, but some of the incidents were described in the local newspaper, including the stories of two brothers and a friend who drowned while swimming (*DDH*

1870a) and another teenage boy who perished while boating home from a picnic (*DDH* 1872b). The fact that all 14 deaths took place between late May and early September is more suggestive of recreational rather than occupational drownings. Additionally, if occupational drownings were common, they might be expected more often among adult males than adolescents. However, using population data from the 1860 Census and the drownings listed in the City Cemetery records that year, the drowning-related death rates per 10,000 were calculated as 14 for children, 24 for adolescents, and 18 for adults.

Local news articles published on two consecutive days in 1872 announced the drownings of two children and three adolescents in recreational boating accidents. The earlier article opens, “The first, for this season, of the annual drowning horrors that visit Dubuque occurred last night,” suggesting that these circumstances were all too common (*DDH* 1872a, b). Dubuque’s relatively high incidence of drowning is significant for the current project because, unlike the other common adolescent causes of death found in the records, drowning leaves no evidence on the bones. The public health information extrapolated from the historical sources discussed in this section can help to more clearly interpret skeletal markers of disease and trauma among adolescents and population in general.

7.3. The Third Street Cemetery Skeletal Sample

The 883 individuals from the Third Street Cemetery who could be assigned to a general age class include 395 infants 0 to 3 years (44.7%), 75 children 3 to 12 years (8.5%), 43 adolescents 12 to 20 years (4.9 %), and 370 adults around 20 years or older (41.9%) (Figure 7.3). As defined in Chapter 6, social adolescence in nineteenth-century Dubuque – 13 to 18 years for females, 15 to 19 years for males – encompassed a narrower age range than the commonly used osteological age category (12 to 20 years). However, given that sex could be determined for only 25 of the potential adolescents and given the broad age ranges assigned to poorly preserved skeletons, all individuals with age estimates overlapping the 12 to 20 year range are considered here, as each individual’s age range encompasses at least some the years of social adolescence. Along with age, pubertal stage was evaluated following Shapland and Lewis (2013), though pubertal markers were unobservable or ambiguous in just over half of the adolescents (22/43). As poor preservation and missing data often hampered assignment to a specific pubertal stage, adolescents were classified simply as either pre- or post-peak height velocity (PHV). The threshold of PHV is an important one, as females achieve menarche and males complete voice change approximately one year after PHV. These two milestones of physical maturity likely distinguished adolescents as near-adults rather than older children (Shapland and Lewis 2013). Additionally, the pubertal stages following PHV, deceleration and maturation, may be associated with impaired immune function and increased mortality risk (McDade 2003:118). See Table 7.10 for adolescent age, sex, and pubertal stage estimates and Appendix A for complete adolescent burial descriptions.

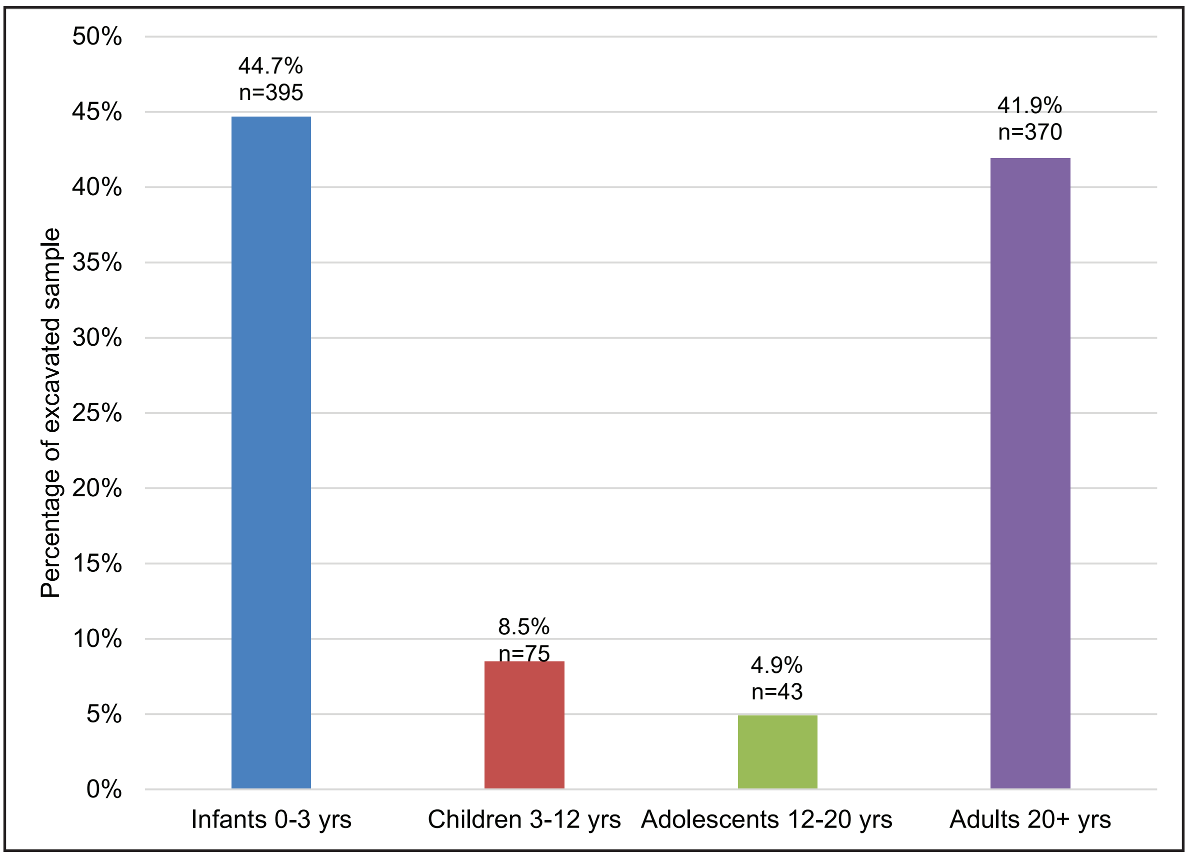

Figure 7.3. Bar graph showing the age class distribution of individuals excavated from the Third Street Cemetery.

Table 7.10. Age, sex, and pubertal stage of adolescents excavated from the Third Street Cemetery. All ages given in years. Pubertal stage evaluated following Shapland and Lewis (2013).

Burial #	Age estimate	Age midpoint	Sex	Pubertal markers?	Pubertal stage
1994-4	15.0-16.0	15.5	Indeterminate	All phalanges unfused, epiphyses unobservable.	Pre-PHV or PHV
15	15.5-17.5	16.5	Possible female	Unobservable	Unobservable
19	13.5-15.5	14.5	Indeterminate	Unobservable	Unobservable
24	15.5-18.5	17.0	Male	Unobservable	Unobservable
71	15.0-18.0	16.5	Male (based on clothing)	Distal radius fused.	Post-PHV
85	15.5-18.0	16.75	Indeterminate	Phalanges fully fused, but iliac crest and distal radius unfused. Epiphyses unobservable.	Post-PHV
90	13.5-17.5	15.5	Indeterminate	Unobservable	Unobservable
186	13.5-15.5	14.5	Possible female	Phalanges unfused, epiphyses unobservable.	Pre-PHV or PHV
206-1	17.5-19.5	18.5	Female (based on clothing)	Distal radius fused, iliac crest unfused (epiphysis unobservable).	Post-PHV
236	11.5-14.5	13.0	Indeterminate	Unobservable	Unobservable
255	15.0-19.0	17.0	Female	Radius recently fused, iliac crest actively fusing.	Post-PHV
270	12.5-17.5	15.0	Indeterminate	Unobservable	Unobservable
287	15.5-20.5	18.0	Female	Distal radius fused	Post-PHV
302	18.5-22.5	20.5	Male	Unobservable	Unobservable
349A	13.0-14.5	13.75	Female (based on clothing)	Distal radius, phalanges, and iliac crest unfused. Epiphyses unobservable.	Pre-PHV or PHV
355	15.0-16.0	15.5	Indeterminate	Distal radius, phalanges, and iliac crest unfused. Epiphyses unobservable.	Pre-PHV or PHV
361B	16.0-17.5	16.75	Male	Distal radius and phalanges fully fused; iliac crest unfused (epiphysis unobservable).	Post-PHV
369	13.0-14.5	13.75	Indeterminate	Distal radius, phalanges, and iliac crest unfused. Epiphyses unobservable.	Pre-PHV or PHV
378	17.5-21.0	19.25	Female	Iliac crest unfused, epiphysis unobservable.	Pubertal stage unknown
396	17.0-20.5	18.75	Female	Unobservable	Unobservable
404	17.5-21.5	19.5	Male	Unobservable	Unobservable
416	15.5-18.0	16.75	Indeterminate	Unobservable	Unobservable

Table 7.10. Age, sex, and pubertal stage, continued.

Burial #	Age estimate	Age midpoint	Sex	Pubertal markers?	Pubertal stage
459	14.0-25.0	19.5	Possible female	The few observable hand phalanges are fused.	Post-PHV
460A	14.0-25.0	19.5	Possible female	Unobservable	Unobservable
582	13.5-17.5	15.5	Indeterminate	Unobservable	Unobservable
583B	14.0-25.0	19.5	Possible female	Unobservable	Unobservable
592	11.5-14.5	13.0	Indeterminate	Proximal and intermediate phalanges unfused (distal unobservable), iliac crest unfused. Mandibular canine root apex 1/2 closed.	Pre-PHV
659	17.5-19.0	18.25	Possible male	Unobservable	Unobservable
682	13.5-16.5	15.0	Indeterminate	Unobservable	Unobservable
691	11.5-14.5	13.0	Indeterminate	Unobservable	Unobservable
735	12.0-13.5	12.75	Indeterminate	Mandibular canine apex complete; radius unfused.	PHV or post-PHV
783	15.0-18.0	16.5	Female	Radius in the process of fusing, all phalanges fully fused, iliac crest present but unfused.	Post-PHV
784	13.0-15.5	14.25	Indeterminate	Unobservable	Unobservable
817	12.0-15.0	13.5	Indeterminate	Unobservable	Unobservable
818	17.0-20.0	18.5	Male	Recent fusion of distal radius, all phalanges fully fused, iliac crest actively fusing at time of death.	Post-PHV
846	18.5-22.5	20.5	Indeterminate	Unobservable	Unobservable
850	16.0-25.0	20.5	Possible female	Unobservable	Unobservable
880A	13.5-15.0	14.25	Indeterminate	Distal radius unfused, proximal and intermediate phalanges unfused. Epiphyses unobservable.	Pre-PHV or PHV
913-2	17.0-18.0	17.5	Male	Iliac crest unfused, epiphysis unobservable.	Pubertal stage unknown
914-1	15.0-19.5	17.25	Female	Distal radius actively fusing, proximal and intermediate phalanges fused, iliac crest unfused (epiphysis unobservable).	Post-PHV
935	18.0-20.5	19.25	Female	Distal radius fully fused.	Post-PHV
971	17.5-20.0	18.75	Female	Distal radius fused, all phalanges fused, iliac crest actively fusing	Post-PHV
990	15.0-16.0	15.5	Male	Proximal and intermediate phalanges unfused (distal unobservable).	Pre-PHV or PHV

7.4. Adolescence, Puberty, and Menarche in the Third Street Sample

Of the 21 individuals whose pubertal stage could be evaluated, one had clearly not reached PHV, while seven were either pre-PHV or had reached PHV. Another individual was either experiencing PHV or had surpassed it at the time of death, while 12 individuals had passed PHV and were likely in the deceleration or maturation phase. The range of age midpoints for individuals pre-PHV or at PHV is 13.0-15.5 years, with a total age estimate span of 11.5-16.0 years. The range of age midpoints for post-PHV individuals is 16.5-19.5 years, with a total age span of 14.0-25.0 years.

Of the 16 females or possible females among the adolescents, pubertal stage could not be determined for six. Two females aged approximately 13.0 to 15.5 years were evaluated as pre-PHV or PHV, while the remaining eight were post-PHV. Of these eight females, five had fused distal phalanges and/or a fusing iliac crest or fully ossified epiphysis, indicating that menarche was achieved before death. The full age range for the post-menarcheal individuals is 14.0 to 25.0 years, while the range of midpoint ages is 16.5 to 19.5 years. Markers of menarche were not observable on the remaining three females.

Only nine adolescents in the Third Street Cemetery sample were identified as male. Of these, pubertal stage could be determined for only four. One male aged 15.0 to 16.0 years was pre-PHV or experiencing PHV at death. The three post-PHV males had a midpoint age range of 16.5-18.5 years, with a total age estimate span of 15.0-20.0 years.

7.5. Observations of Pathology in the Third Street Sample

To determine whether or not age-related differences exist in the frequency rates of the six selected markers of stress, disease, and trauma, the counts for each marker were first considered separately. Following this analysis, the observations were grouped into two categories. The first category includes the early-life stress markers (linear enamel hypoplasia and cribra orbitalia/porotic hyperostosis) which may indicate recent or perimortem illness among infants and young children or a previous episode of ill health among older individuals. The second category includes labyrinthine endocranial lesions, nonfocal periosteal new bone formation, tubercular lesions, and unhealed trauma, all of which could potentially be related to cause of death for individuals of any age.

7.5.1. LINEAR ENAMEL HYPOPLASIAS (LEH)

Only LEH occurring on anterior teeth were considered during this study. Inclusion in the analysis required at least three observable anterior teeth or two anterior teeth with matching defects. Presence or absence of LEH could be scored for only 489 individuals from the Third Street Cemetery (Table 7.11, Figure 7.4).

The differences in the frequencies of LEH between age classes demonstrate no pattern beyond the expected accumulation of stress markers with advancing age. The enamel of deciduous and permanent anterior tooth crowns is laid down from around 30 weeks *in utero* until the age of 6.5 years (AlQahtani *et al.* 2010). All of the infants and many of the children in this sample died before crown formation was complete, and thus had a shorter window of opportunity for LEH accumulation than individuals who survived past seven years. When individuals in the “Child” class aged seven years or older were considered separately, they were found to have an LEH frequency rate similar to that of adolescents and adults, with 14 out of 19 observable children exhibiting LEH (74%).

Table 7.11. Number of individuals from Third Street observed with LEH absent/present, divided by age class.

Age Class	# observable for LEH	# without LEH	# with LEH	% with LEH
Infant	140	130	10	7.1
Child	65	31	34	52.3
Adolescent	41	10	31	75.6
Adult	243	73	170	70.0
Total:	489	244	245	50.1

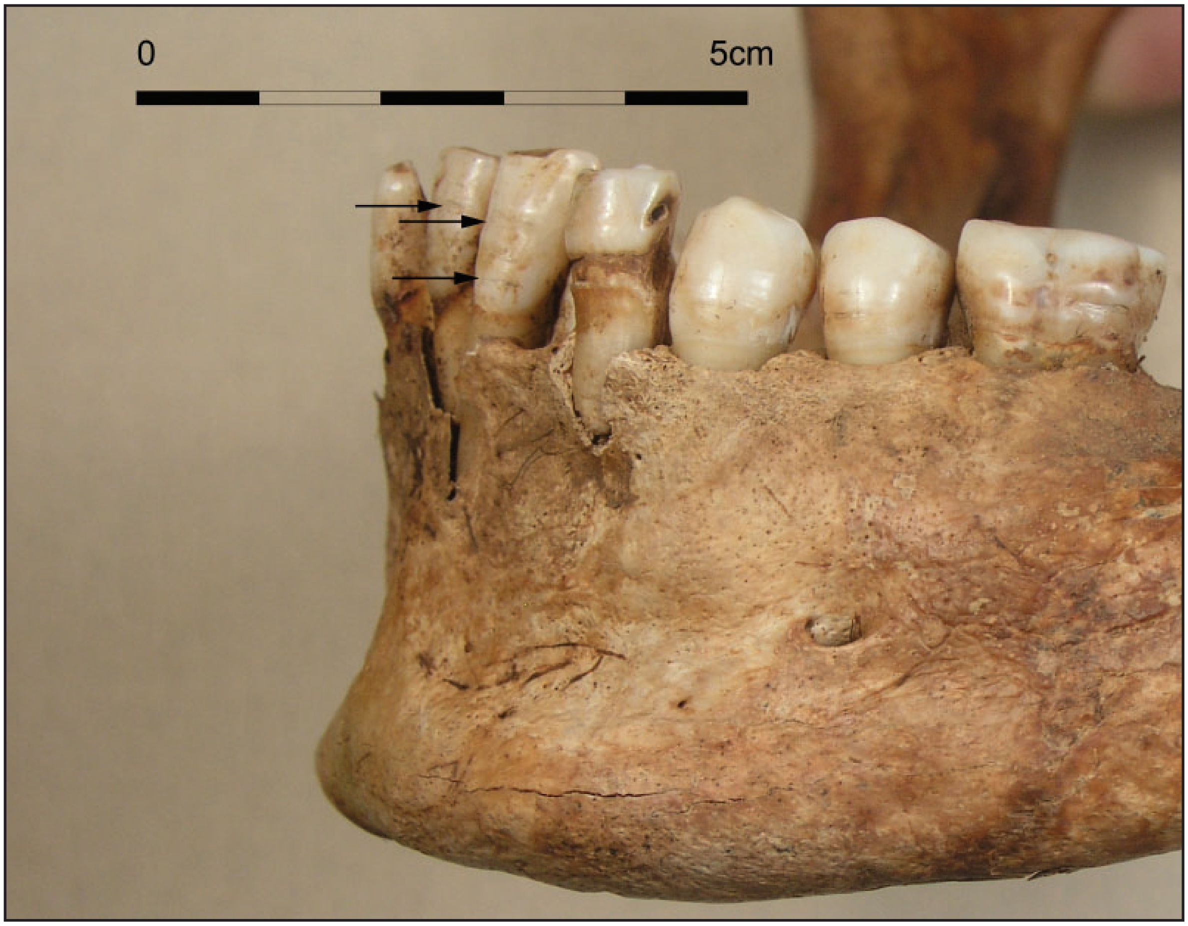

Figure 7.4. Left lateral view of the mandible from Burial 818, which held a 17.0-20.0-year-old male. Arrows point to some of the deeper linear enamel hypoplasias on the anterior teeth. This individual also has a retained deciduous canine and slight periosteal bone apposition on the left mandibular body. Image used with permission from the University of Iowa Office of the State Archaeologist.

Of course, if the alveoli for the majority of sub-adults were intact, age patterns of eruption would be expected to affect the observed LEH rates as well, since tooth crowns in crypts could bear unseen LEH. In the Third Street collection, however, the dentition of young sub-adults was often recovered as groups of loose tooth crowns, allowing for both erupted and unerupted teeth to be examined for hypoplasias. To demonstrate that the rate of individuals with LEH was not affected by a low number of crowns observable among sub-adults, the number of observable teeth was compared to the number of teeth with LEH for each age class (Table 7.12). Adults, adolescents, and children around seven years or older all exhibit similar rates of affected teeth, while younger children (< seven years) and infants have substantially lower rates. Most of the observable tooth crowns for infants were deciduous, as the permanent incisor crowns are not ¾ complete until around 1.5-2.5 years, while the canines reach this stage around 3.5 years (AlQahtani *et al*. 2010). Of the infants (n=10) and younger children (n=20) identified with LEH, only one individual displayed defects on deciduous teeth. Two other individuals with deciduous dental hypoplasias were not counted in this analysis, as the defects were not linear in form. Though only 35.4% (140/395) of individuals in the infant class had enough loose or erupted anterior teeth preserved to be observable for LEH, the rarity of enamel defects on deciduous incisor crowns, which form almost entirely *in utero*, is suggestive of adequate maternal nutrition and health for at least a portion of the population.

Though it is not possible to speculate about the prevalence rate of LEH among the living population of Dubuque based on this sample of non-survivors, it is clear that early life health and nutritional insults severe enough to affect enamel formation were not uncommon.

Table 7.12. Number of anterior teeth (deciduous and permanent) observable for LEH, pooled for each age class. The number and percentage of anterior teeth observed with LEH demonstrates the low incidence of enamel hypoplasias among infants (0-3 years).

Age Class	# of anterior teeth observable for LEH	# of anterior teeth with LEH	% of anterior teeth with LEH
Infant	1,097	59	5.4
Child (3-7 yrs)	437	116	26.5
Child (7-12 yrs)	177	96	54.2
Adolescent	393	232	59.0
Adult	1,767	1,061	60.0

7.5.2. CRIBRA ORBITALIA AND POROTIC HYPEROSTOSIS

Of the relatively intact crania, 569 had orbits and cranial vaults sufficiently represented for the observation of cribra orbitalia (CO) and porotic hyperostosis (PH) (Table 7.13). The overwhelming majority (85.7%, 78/91) of cases involved CO only, while seven individuals had only PH, and six individuals (two infants, one child, three adults) presented with both CO and PH. Statistically significant differences in prevalence rates were noted for children (42.1%, 24/57), who exhibited CO and/or PH at a significantly higher rate, and adults (8.7%, 27/309), who exhibited the pathological markers at a significantly lower rate (χ^2=43.78, df=3, p=0.000). These prevalence rates are congruent with osteological expectations. Individuals in the child category lived for more years than those in the infant category, and thus had greater opportunity to develop these lesions in response to chronic illness. Due to the conversion of red marrow to yellow marrow in the cranial vault and the increased marrow space available in mature cranial bone, new lesions are unlikely to form after the age of around 11 years (15 years maximum) (Brickley 2018; Lewis 2018a:194). Older children in the cemetery population, therefore, had reached the peak of potential accumulation of CO/PH due to marrow hyperplasia or hypoplasia just before death. The timing of the conversion of marrow in the posterior portion of the vault can be variable, sometimes continuing into adulthood (Brickley 2018:3-5). However, in the Third Street sample, adolescents (Figure 7.5) and adults with CO/PH exhibited healed or healing lesions, according to photographs and occasional notes, indicating they acquired the initial lesions well before death and survived the causative health insult. The lower rate of CO/PH observations in these older individuals suggests that conditions severe enough to cause the bony lesions in children had a high mortality rate in this population. Individuals who died in adolescence or adulthood and did not exhibit these lesions either a) avoided health/living conditions which cause CO/PH; b) suffered from such conditions after marrow conversion, without osteological expression in the form of CO/PH; or c) survived the causative health condition long enough for lesions to completely heal. Though apparent healing is often observed osteologically (as well as clinically), there is some uncertainty as to whether or not these lesions are ever completely remodelled (Lewis 2018a:194; Moseley 1974:169; Ortner 2003:104).

Table 7.13. Number of individuals from Third Street observed with cribra orbitalia and/or porotic hyperostosis (CO/PH) absent/present, divided by age class.

Age Class	# observable for CO/PH	# without CO/PH	# with CO/PH	% with CO/PH
Infant	161	131	30	18.6
Child	57	33	24	42.1
Adolescent	42	32	10	23.8
Adult	309	282	27	8.7
Total:	569	478	91	16.0

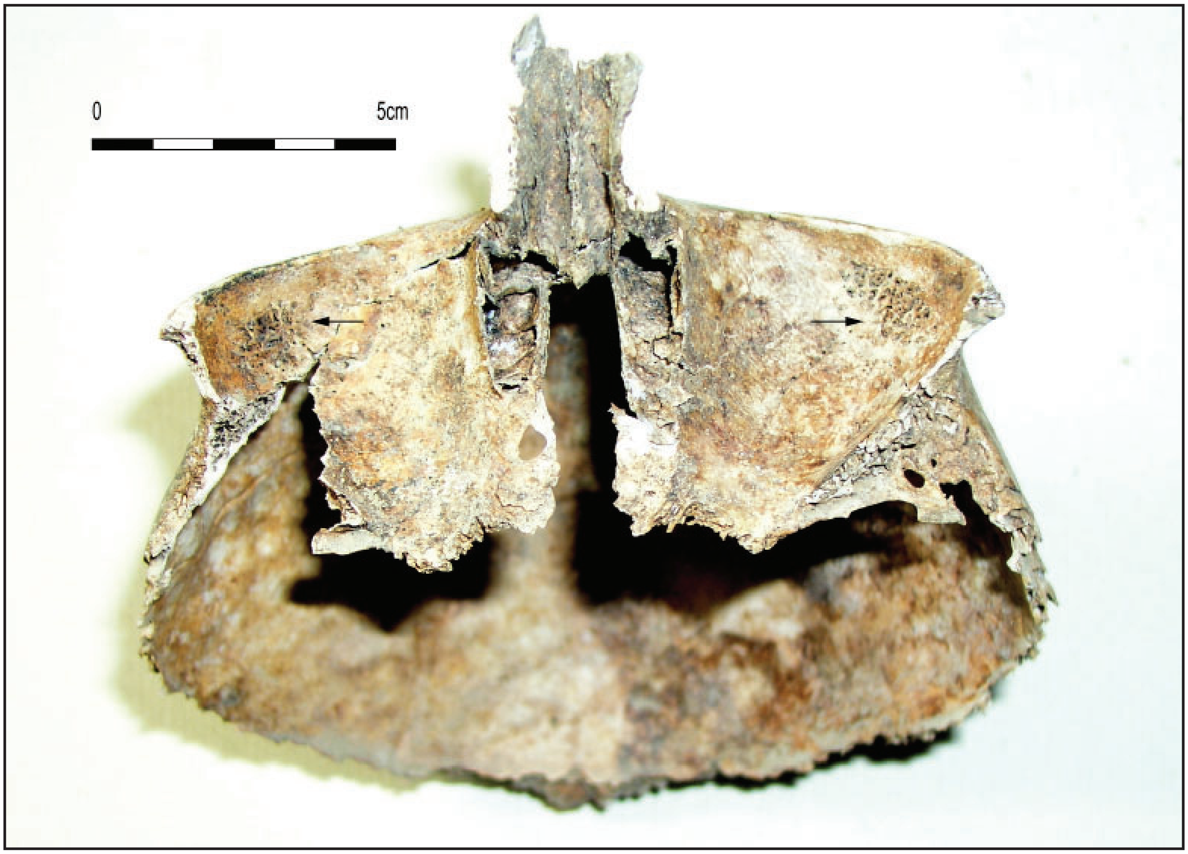

Figure 7.5. Inferior view of the frontal from Individual 2, Burial 913 (male, 17.0-18.0 years). Arrows point to healing cribrotic lesions in both orbits. Image used with permission from the University of Iowa Office of the State Archaeologist.

7.5.3. LABYRINTHINE ENDOCRANIAL LESIONS

Of the relatively intact individuals, 569 had cranial vaults sufficiently complete for the observation of labyrinthine endocranial lesions (Table 7.14). Adolescents exhibit the highest prevalence rate for this pathological finding, but significance could not be reliably established through a chi-square test of independence, as some expected counts were smaller than five. Fisher's Exact Test demonstrates that the adolescents in this population had a significantly higher prevalence of endocranial lesions than adults exhibited (p=0.000). The differences in prevalence rates between adolescents and the two younger groups were not found to be significant. The greater frequency among sub-adults in general is consistent with observations of other skeletal collections, and is likely due to the fact that subadult bone reacts more readily to the inflammatory or traumatic stimuli which cause the production of endocranial new bone (Lewis 2004; Shultz 2001) (Figure 7.6).

Table 7.14. Number of individuals from Third Street observed with labyrinthine endocranial lesions absent/present, divided by age class.

Age Class	# observable	# without endocranial lesions	# with endocranial lesions	% with endocranial lesions
Infant	161	145	16	9.9
Child	57	54	3	5.3
Adolescent	42	36	6	14.3
Adult	309	305	4	1.3
Total:	569	540	29	5.1

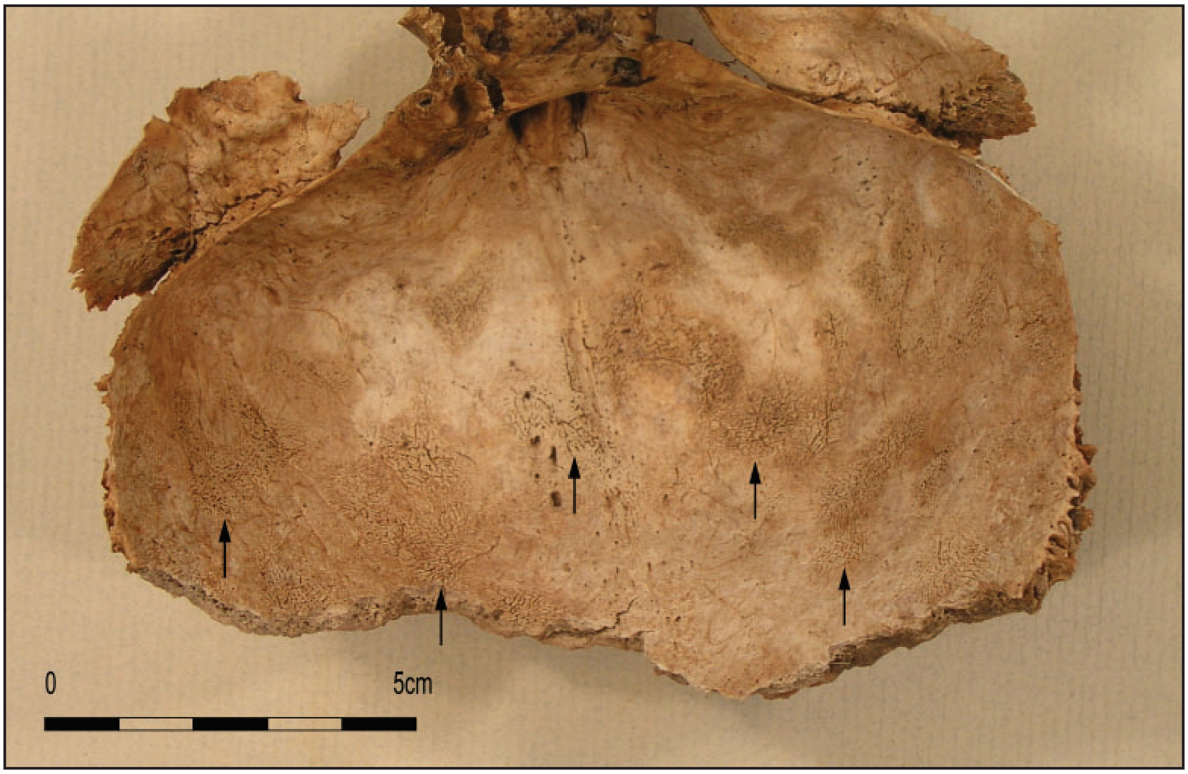

Figure 7.6. Endocranial surface of the frontal from the individual in Burial 783 (female, 15.0-18.0 years), exhibiting the capillary form of endocranial lesions across much of the surface. Image used with permission from the University of Iowa Office of the State Archaeologist.

7.5.4. NONFOCAL PERIOSTEAL NEW BONE FORMATION

Of the relatively intact skeletons, 476 had sufficient representation of the postcranial elements for the observation of nonfocal periosteal new bone formation (Table 7.15). Periosteal new bone formation was counted as present only if bony reaction was observed on multiple elements and was not associated with a healing or healed fracture. Periosteal bone formation on the pleural rib surface was recorded separately (see Section 7.5.5).

Evidence of diffuse periostosis was not observed on any of the infant skeletons. No statistically significant differences were found between the prevalence rates of the remaining age classes.

Table 7.15. Number of individuals from Third Street observed with nonfocal periosteal new bone formation absent/present, divided by age class.

Age Class	# observable	# without periosteal new bone formation	# with periosteal new bone formation	% with periosteal new bone formation
Infant	74	74	0	0.0
Child	48	47	1	2.1
Adolescent	40	34	6	15.0
Adult	314	291	23	7.3
Total:	476	446	30	6.3

7.5.5. SKELETAL MARKERS OF TUBERCULOSIS/PULMONARY DISEASE

Of the relatively intact skeletons, 476 had sufficient representation of postcranial elements for observation of the presence or absence of skeletal markers commonly associated with tuberculosis (TB) and pulmonary disease (Table 7.16). One additional individual (Burial 282), whose lower half was removed by historic earth-moving activities, was also included in the prevalence calculations, due to the observation of lesions related to TB or pulmonary disease. Altogether, 11 individuals were considered to be likely tubercular or suffering from other chronic pulmonary disease. Of these, nine exhibited periosteal new bone formation on the visceral rib surface, with as few as three or as many as 12 ribs observed to be affected (Burials 206-1, 282, 302, 355, 432, 477, 501, 840, 927). The old adult female in Burial 977 exhibited evidence of possible TB in the form of a large destructive lesion of the auricular surface of the left os coxa (Figure 7.7). The last individual included in this group, the middle-aged man in Burial 101, exhibits a large lytic lesion of the right mastoid, interpreted as mastoiditis secondary to pulmonary TB. This diagnosis is based on the identification of the individual as William Blake, who died from consumption in 1868, and on an early twentieth-century medical journal article which links tuberculosis of the ear with tubercular processes in other parts of the body in the pre-antibiotic era (Goldstein 1903; Mack 2013f:273). Pathognomonic manifestations of TB, lytic lesions of vertebral bodies with associated kyphosis, were not observed on any of the Third Street individuals.

Rib lesions considered to be likely evidence of tubercular infection or pulmonary disease were not observed on the remains of infants and children in this population.

Fisher's Exact Test found no significant difference between the prevalence rates for adolescents and adults in the Third Street Cemetery.

Table 7.16. Number of individuals from Third Street observed with skeletal markers of tuberculosis or pulmonary disease absent/present, divided by age class.

Age Class	# observable for possible TB lesions	# without possible TB lesions	# with possible TB lesions	% with possible TB lesions
Infant	74	74	0	0.0
Child	48	48	0	0.0
Adolescent	40	37	3	7.5
Adult	315	307	8	2.5
Total:	477	466	11	2.3

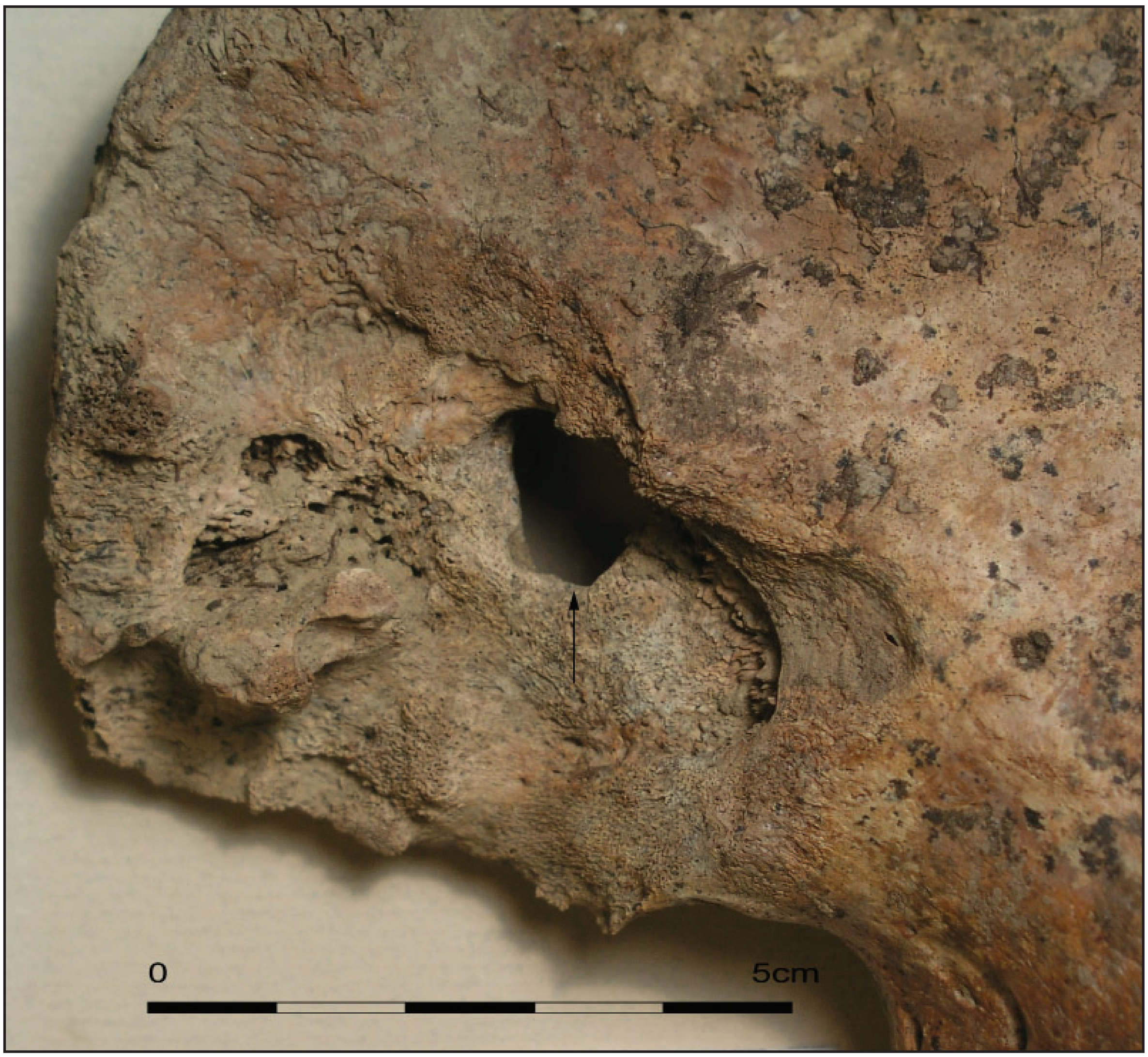

Figure 7.7. Close-up of the penetrating lesion that destroyed the auricular surface of the left os coxa of the adult found in Burial 977. Image used with permission from the University of Iowa Office of the State Archaeologist.

7.5.6. PERIMORTEM TRAUMA

Only skeletons with substantial representation of both cranial and postcranial remains were considered observable for the absence or presence of perimortem trauma. Of the 458 relatively complete individuals, only seven exhibit evidence of perimortem trauma, all of whom were adults (Table 7.17). Two middle-aged males (in Burials 1015B and 1026) appear to have been gunshot victims, one possibly self-inflicted based on the location of the entrance wound on the right temporal. Another male (Burial 446) was apparently stabbed in the chest, based on cut marks near the sternal end of a left rib. The woman in Burial 1022 suffered two perimortem fractures to the right parietal consistent with blunt force trauma. Two middle-aged male individuals suffered severe leg fractures. The first, the man in Burial 110, had a complete fracture of the left clavicle near midshaft and a spiral fracture of the left femur beginning just distal to the femoral neck. The second man (Burial 1025) suffered comminuted fractures of the distal femora and proximal tibiae and simple fractures of both fibulae. The last individual, the middle-aged male in Burial 152, died without healing after a trepanation (Figure 7.8). No additional cranial trauma is observable, leaving the reason for the operation unknown.

One adolescent, the 15- to 18-year-old in Burial 85, was found to have incompletely healed trauma at the time of death. The individual has an unfused fracture of the distal third of the right fibula shaft, with active periosteal bone formation. Though it is likely this individual survived the traumatic incident for a period of time and eventually succumbed due to co-occurring soft tissue injuries, it is also possible that the fracture was unrelated to cause of death. The absence of clear evidence for perimortem trauma among the adolescents in the Third Street sample is interesting in light of mortality data found in historical documents (Section 7.2.4). Accidental causes accounted for almost 20% (23/123) of teenagers' deaths in the City Cemetery records, but more than 60% of those cases (14/23) were due to drowning, an external cause of death which leaves no skeletal evidence.

Table 7.17. Number of individuals from Third Street observed with evidence of perimortem trauma absent/present, divided by age class.

Age Class	# observable for perimortem trauma	# without perimortem trauma	# with possible perimortem trauma	% with possible perimortem trauma
Infant	74	74	0	0.0
Child	44	44	0	0.0
Adolescent	40	40	0	0.0
Adult	300	293	7	2.3
Total:	458	451	7	1.5

Figure 7.8. Unhealed trepanation on the right parietal of the middle-aged male in Burial 152. Image used with permission from the University of Iowa Office of the State Archaeologist.

7.5.7. AGE AND INDIVIDUAL PATHOLOGICAL OBSERVATIONS IN THE THIRD STREET SAMPLE

When observations of pathological markers of poor nutrition and disease are divided by age class, the patterns that emerge for the Third Street population show little deviation from expectations based on the nature of bony reaction within different age groups. Fewer children who died under the age of 6.5 years had accumulated LEH than adolescents and adults who died after their anterior dentition was complete. Children who reached the age of around 12 had the maximum exposure time to anaemias (or other causative factors) while the cranial vault was still involved in hematopoiesis. Therefore, they exhibit CO and PH at a significantly higher rate than infants, who died with a shorter window of opportunity for exposure, and adolescents and adults, who survived past the childhood period of lesion manifestation. The greater prevalence of labyrinthine endocranial lesions among sub-adults of all ages mirrors findings from other collections and is likely due to the intensity of reaction in immature bone. As both active and healed periostosis were recorded in this study, the greater prevalence in adolescents and adults is likely cumulative. The greater prevalence of possible tubercular and pulmonary disease lesions among adolescents and adults reflects the mortality of infants due to primary tuberculosis (before skeletal elements are affected) and the tendency for children to present with more subtle bony changes in response to the disease (Lewis 2011:20). Perimortem trauma is the only pathological observation that deviated substantially from expectations, as the complete lack of trauma among adolescents is incongruent with data from community death records (Section 7.2.4).

Adolescents in the Third Street Cemetery population exhibited the highest rates of labyrinthine endocranial lesions, nonfocal periosteal new bone formation, and tubercular/pulmonary lesions, though the apparently greater prevalence of these lesions among teenagers was not found to be statistically significant. Significant differences between adolescents and the rest of the population were not identified until multiple markers were taken into account, as described in Section 7.6.

7.5.8. SEX AND PATHOLOGICAL OBSERVATIONS IN THE ADOLESCENT SAMPLE FROM THE THIRD STREET CEMETERY

As sex could not be determined for almost half of the adolescents from the Third Street sample (44%, 19/43), few pathological marker prevalence comparisons can be made between males and females. Each group of teenagers exhibiting a particular pathological marker includes multiple indeterminate individuals. The exception is nonfocal periosteal bone formation. Sex was determined for all adolescents recorded with this pathological finding, and the group includes three males and three females. There is no osteological evidence in the Third Street sample of adolescents that either sex suffered disproportionately from chronic illness.

7.5.9. CORRELATIONS BETWEEN INDIVIDUAL PATHOLOGICAL OBSERVATIONS IN THE THIRD STREET CEMETERY SAMPLE

In order to determine whether or not any statistically significant correlations exist between the individual pathological markers observed in the Third Street Cemetery population, Spearman’s correlation coefficients were calculated for the six osteological observations previously described. Individuals of all age classes whose skeletal and dental remains were sufficiently complete for all observations were included in these calculations (n=354). As seen in Table 7.18, no strong correlations between individual pathological manifestations were identified. All correlation coefficients are close to zero, which indicates a lack of correlation. These results present no evidence of significant co-occurrence of particular skeletal markers of pathology in the Third Street sample.

Table 7.18. Spearman correlation coefficients (with associated *p* values below) for the six pathological markers observed in the Third Street Cemetery sample. LEH=linear enamel hypoplasia, CO/PH=cribra orbitalia/porotic hyperostosis, Perio.=periosteal new bone formation, Endo. Lesion=labyrinthine endocranial lesions, TB/Pulm.=tubercular or pulmonary disease lesions, Peri-trauma=perimortem trauma.

Pearson Correlation Coefficients, N = 354						
(Perfect positive correlation=+1, perfect negative correlation=-1)						
	LEH	**CO/PH**	**Perio.**	**Endo. Lesions**	**TB/Pulm.**	**Peri-trauma**
LEH	1.000	-0.103 p=0.0520	0.039 p=0.4682	-0.035 p=0.5176	0.073 p=0.1683	0.032 p=0.5499
CO/PH	-0.103 p=0.0520	1.000	0.054 p=0.3071	0.112 p=0.0347	0.100 p=0.0606	-0.064 p=0.2332
Perio.	0.039 p=0.4682	0.054 p=0.3071	1.000	0.121 p=0.0223	0.102 p=0.0540	0.030 p=0.5784
Endo. Les.	-0.035 p=0.5176	0.112 p=0.0347	0.121 p=0.0223	1.000	0.158 p=0.0029	-0.032 p=0.5497
TB/Pulm.	0.073 p=0.1683	0.100 p=0.0606	0.102 p=0.0540	0.158 p=0.0029	1.000	-0.020 p=0.7052
Peri-trauma	0.032 p=0.5499	-0.064 p=0.2332	0.030 p=0.5784	-0.032 p=0.5497	-0.020 p=0.7052	1.000

7.6. Early Childhood Pathology and Additional Disease Markers

Linear enamel hypoplasias of the anterior teeth record nutritional deficiencies or health insults occurring prior to the age of 6.5 years (AlQahtani *et al*. 2010), and CO and PH lesions are unlikely to form in response to new health insults after the age of 11 to 15 years (Brickley 2018; Lewis 2018a:194). Therefore, the presence of one or more of these pathological markers indicates a health issue (or issues) that first emerged in infancy or childhood, regardless of whether the child succumbed, recovered, or continued to suffer from the same condition past the age limit for new manifestations of such lesions. The remaining three disease markers recorded in this study (labyrinthine endocranial lesions, periosteal new bone formation, and TB/pulmonary disease lesions) can affect the skeleton at any age and therefore could potentially be related to cause of death for individuals in all age categories.

To investigate how episodes of chronic childhood illness or stress might affect susceptibility to disease later in life (acquired frailty), the number of individuals exhibiting both early childhood pathology markers and other disease markers was calculated for each age class. Only skeletons with at least three anterior teeth observable and substantial preservation of both the cranium and postcranial elements were included in this tally, which brought the sample size down to 354 (Table 7.19).

Table 7.19. Number of individuals from Third Street observable for evidence of early childhood health issues and additional pathological markers, divided by age class.

Age Class	# with dental, cranial, and postcranial remains	# with early markers	# with other pathological markers	# with both early and additional markers	% with both early and additional markers
Infant	45	13	4	2	4.4
Child	43	34	3	2	4.7
Adolescent	38	32	10	10	26.3
Adult	228	165	28	19	8.3
Total:	354	244	45	33	9.3

Only 28.9% (13/45) of infants in this smaller sample were identified with early-life markers (LEH, CO/PH, or both). Only four infants (8.9%) presented with any of the additional pathology markers, which were limited in this age class to endocranial lesions. The number of individuals in the infant age class with markers from both groups observed was just two (2/45, 4.4%), both of which had CO and endocranial lesions. In the child age class, 79.1% (34/43) of individuals in the sample were observed with early-life markers, while 7.0% (3/43) had additional markers (endocranial lesions, periosteal new bone formation). Only two children (2/43, 4.7%) exhibited both types of markers, one with CO and endocranial lesions, and one with LEH, CO, endocranial lesions, and periosteal new bone formation on the ilia and lower vertebrae.

Of the adolescents in this sample, 84.2% (32/38) were observed with early-life markers, while 26.3% (10/38) exhibited additional markers (endocranial lesions, periosteal new bone formation, TB/pulmonary disease lesions). All of the adolescents with these later pathological markers also displayed evidence of early life stress or disease, so the number with both types of markers is 10/38, 26.3% compared to the 4.5% seen in infants and children. Of course, this figure is not truly comparable with those of the younger age classes, as infants had less opportunity to accumulate enamel hypoplasias and cranial porosity before death, and infants and children were less likely to exhibit diagnostic tubercular lesions. However, the difference between adolescents and adults is also striking. Of the adults in the sample, 72.4% (165/228) displayed early-life markers and 12.3% (28/228) had one or more of the additional three markers, but only 8.3% (19/228) exhibited both types of pathological markers. Fisher's Exact Test shows that the group of individuals who died in adolescence had a significantly greater tendency to exhibit both types of markers ($p=.003$) than those who survived longer and joined the cemetery population as adults.

The implication of these findings is that adolescents who had suffered but survived health insults in early childhood were more susceptible to chronic disease, whether a recurrence of the same infection (such as secondary TB) or an illness of a different type. It cannot be proven that chronic illness caused the deaths of these 10 adolescents, as unrelated, osteologically-invisible causes are also possible. However, the presence of active skeletal lesions indicates an individual has an elevated risk of death (Wood *et al.* 1992:349). Based on the evidence available, it appears that adolescents with frailty acquired due to childhood poor nutrition or illness often succumbed to disease while their stronger peers lived into adulthood, represented by skeletons marked primarily by early childhood stress *or* later disease. These findings are similar to those of Temple's (2014) study of LEH in Late/Final Jomon period children and adolescents, which indicated that individuals who invested energy in surviving early-life stress events had increased vulnerability to later stress events due to trade-offs in future growth and maintenance investments. It is worth noting that of the four Dubuque-area autobiographies discussed in Chapter 6, three include episodes in which the subject suffers a life-threatening illness in adolescence.

7.7. Third Street Adolescents and Chronic Disease

Though no pathognomonic skeletal lesions were observed on the adolescent skeletons, a closer look at the 10 teenagers with multiple pathological markers provides some evidence for specific diseases (Table 7.20). All three adolescents observed with periosteal new bone of the pleural rib surface are included in this group. Of these three, only the individual in Burial 302 exhibits lesions that meet all the criteria proposed for TB by Matos and Santos (2006); the lesions present bilaterally, are located at the vertebral rib ends, and are composed of lamellar bone. The adolescent also displays active periostosis on the anterior surfaces of both tibiae (Figure 7.9). Few hand bones were recovered, but the distal articular surface of one, a proximal phalanx from the left hand, was completely destroyed by lytic processes. Though long bone periostitis and lytic lesions of the hands are not typical markers, both have been clinically observed in sub-adults with TB, particularly when hypertrophic osteoarthropathy manifests secondary to pulmonary TB (Lewis 2018a:160-161). This individual also exhibits numerous small lytic foci on the endocranial surface (Figure 7.10), though the lesions are more similar to arachnoid fovea than to the shallow, erosive defects Hershkovitz *et al*. (2002) associated with TB. The adolescents in Burials 206-1 and 355 present with woven bone at the vertebral ends of ribs on the left side only (Figure 7.11). However, it is still possible that they suffered from TB rather than bronchitis or pneumonia. Both skeletons have slight, healed CO and labyrinthine endocranial lesions. CO in the absence of PH may result from anaemias that cause diploic atrophy or hypoplasia, particularly anaemia of chronic disease, which is often associated with TB (Rivera and Lahr 2017:90). TB is the most common cause of chronic leptomeningitis, which may lead to labyrinthine endocranial lesions, though granuloma-type lesions are more likely (Lewis 2018a:144).

Table 7.20. Adolescent skeletons from the Third Street Cemetery exhibiting markers of early childhood health issues (LEH and CO/PH) and additional pathological markers, including labyrinthine endocranial lesions, nonfocal periosteal new bone formation, and possible tubercular or pulmonary lesions of the ribs.

Burial #	# of LEH/# of anterior teeth	CO/PH	Endocranial lesions	Periosteal new bone formation (location)	TB/ pulmonary lesions
15	26/11	CO	Absent	Femora and tibiae	Absent
206-1	16/12	CO	Present	Absent	7 ribs
255	8/12	PH	Absent	Femora, tibiae, fibulae	Absent
302	4/7	Absent	Absent	Tibiae	5 ribs
355	0/2	CO	Present	Absent	8 ribs
404	0/12	PH	Absent	Maxilla, calcanei, left tarsals	Absent
459	3/4	Absent	Present	Femora	Absent
682	9/12	Absent	Present	Absent	Absent
783	29/12	Absent	Present	Absent	Absent
818	46/12	Absent	Present	Maxilla, mandible, femora	Absent

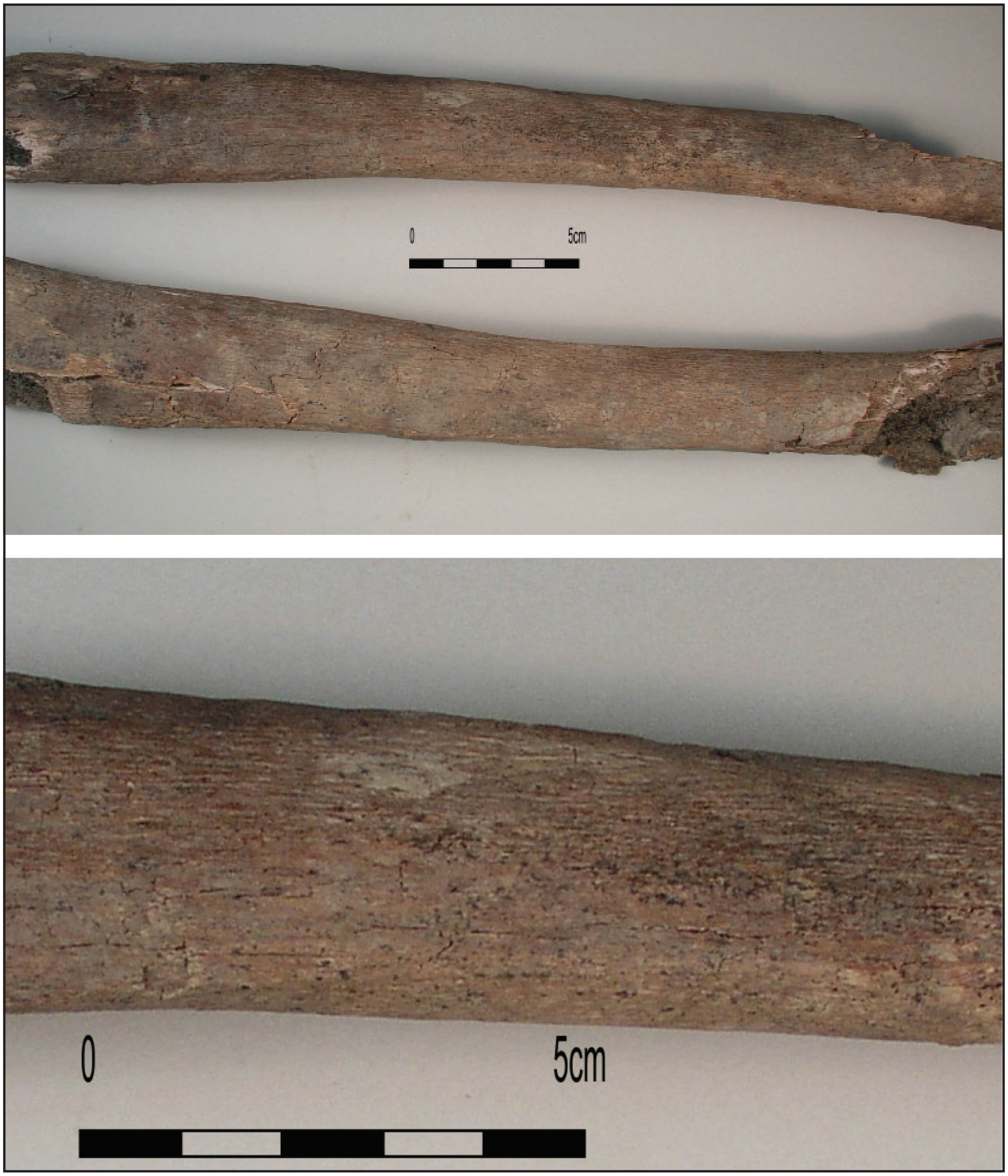

Figure 7.9. Tibiae from the 18.5-22.5-year-old male in Burial 302, exhibiting periosteal new bone formation along the length of the shaft, with greatest apposition at midshaft. Medial view (top). Close-up view of midshaft (bottom). Image used with permission from the University of Iowa Office of the State Archaeologist.

Figure 7.10. Endocranial pitting on the frontal of the young man in Burial 302. Image used with permission from the University of Iowa Office of the State Archaeologist.

Figure 7.11. Three left ribs from the adolescent female (17.5-19.5 years) in Burial 206-1. Arrows point to woven bone apposition on the pleural surface between the neck and the angle. Image used with permission from the University of Iowa Office of the State Archaeologist.

In addition to these likely TB victims, four other adolescents in this group present with labyrinthine endocranial lesions. The individuals in Burials 682 and 783 exhibit no additional pathological markers beyond enamel hypoplasias and carious lesions, with two periapical abscesses in the case of Burial 783. However, the widespread nature of the endocranial lesions argues against trauma (haematoma) as the cause. The adolescent in Burial 682 exhibits lesions on the frontal, both parietals, right temporal, and occipital, with deposits of white fibre bone as well as capillary formations. All cranial vault bones are affected in Burial 783, with both white bone and capillary-form deposits present (see Figure 7.6). Though many aetiologies are possible for endocranial lesions, the extent of the lesions and the absence of other pathological markers suggests meningitis as a possible cause. In modern America, bacterial meningitis occurs most frequently in teenagers and young adults, a tendency which is often attributed to increased social interaction and close living quarters (dormitories) in this age group. However, recent microbiome research has demonstrated that *Neisseria meningitidis*, a common cause of bacterial meningitis, thrives in habitats with large amounts of propionic acid. The microbiota that inhabit the nasopharynx of infants and children produce far less propionic acid than that of older teens and adults, making these older individuals more susceptible to colonisation by *N. meningitidis* (Catenazzi *et al.* 2014). This form of meningitis is more likely to be acute and to kill patients too rapidly for bony reaction. Other forms of bacterial meningitis may be secondary to conditions such as otitis media, typhoid fever, gastroenteritis, measles, whooping cough, or pneumonia (Lewis 2018a:144). In the case of Burial 783, it is possible meningitis was secondary to the maxillary dental abscess.

The other two individuals with endocranial lesions – and childhood health issues indicated by LEH – also present with active, bilateral periostosis of the femora. The adolescent in Burial 459 exhibits capillary formations on the frontal, parietals, temporals, and occipital; mild periosteal new bone formation on both femoral shafts; and a lytic lesion with sclerotic margins on the dorsal surface of the right first metacarpal. The aetiology of this set of markers is unknown; each lesion type could be caused by a separate condition. The individual in Burial 818 exhibits inflammatory pitting and white fibre bone deposits on the frontal, temporals and occipital. Capillary formations were also observed on the frontal, along with some larger pits resembling arachnoid fovea (Figure 7.12). A small amount of periosteal new bone formation is present on the alveolus of the left maxilla and mandible, and on the femora the new bone is restricted to the posterior surface of the distal shaft and the neck. The presence of the larger endocranial pits raises the possibility of TB as a diagnosis, but the distribution of the periostosis does not match the typical presentation of hypertrophic osteoarthropathy. The presence of periosteal new bone formation on the facial bones and at the metaphyses is more suggestive of healed scorbutic lesions (Lewis 2018a:213-218).

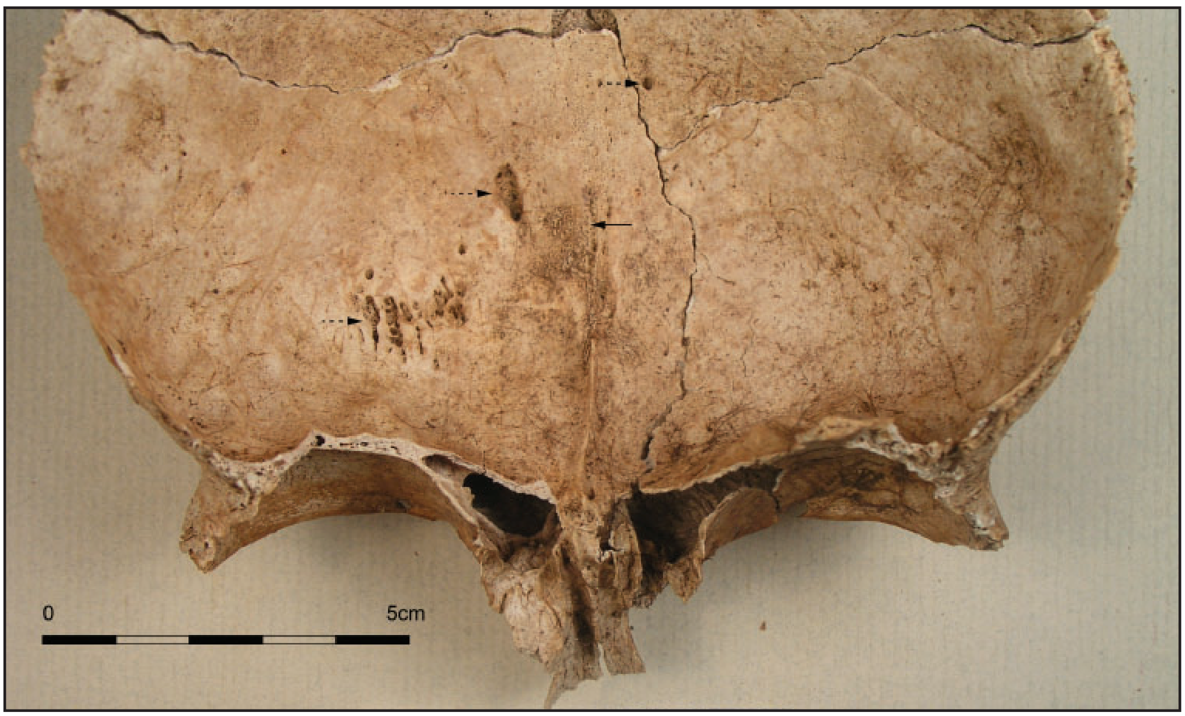

Figure 7.12. Endocranial surface of the frontal from Burial 818. Solid arrow points to a patch of capillary-form endocranial lesions. Dashed arrows point to lytic foci. Image used with permission from the University of Iowa Office of the State Archaeologist.

The adolescents in Burials 15 and 404 present with evidence of possible anaemia in childhood and inflammation/infection close to death, with the first exhibiting slight, healed CO and periosteal new bone formation on the femora and tibiae, and the second presenting with healed PH and periosteal new bone formation on the maxilla, both calcanei, and the left tarsals. During the original analysis, the pathological observations concerning Burial 404 were considered suggestive of TB, given the greater frequency of involvement of the talocalcaneal joint in older children and adolescents with TB (Lillie and Mack 2013:480; Ortner 2003:235-253). However, given that only the non-articular surfaces of calcanei are involved, this diagnosis seems less likely in an individual over the age of nine years (Roberts and Buikstra 2019:338). The last adolescent, the female in Burial 255, likely suffered from multiple conditions. Healed PH and LEH indicate a previous health insult (or insults). A compression fracture of one lumbar body and Schmorl's nodes observed on one lumbar and five thoracic vertebral bodies suggest a previous injury. Periosteal new bone formation (both active and healed) is present on the femora, tibiae, and fibulae, suggesting some type of systemic disease. The calcanei, tali, and most other tarsals present exhibit cortical thinning and porosity (not related to taphonomy) and are lightweight for their size, suggesting osteopenia/osteoporosis (Figure 7.13). Today, significantly decreased bone mineral density and vertebral compression fractures are often observed in adolescent females diagnosed with anorexia nervosa, even after more than one year of recovery (Kueper *et al.* 2015). Involuntary starvation *in utero* has been linked to decreased bone mineral content, while in childhood it is linked to high incidence of pseduoarthrosis, and in older victims, severe demineralisation of the cortex has been reported, as well as higher rates of osteoporosis later in life (Kueper *et al.* 2015). It seems likely that this young woman suffered from a condition such as lymphoblastic leukaemia or other chronic illness or circumstances which prevented her from taking in sufficient nutrition to maintain bone health. Alternatively, she may have been a recent Irish immigrant whose health was previously affected by food scarcity in the Great Famine.

Figure 7.13. Calcanei from the 15.0-19.0-year-old female in Burial 255. Arrow points to cortical thinning and porosity, suggestive of osteopenia/osteoporosis. Image used with permission from the University of Iowa Office of the State Archaeologist.

Although precise diagnoses are not possible for most of the adolescents buried at Third Street, evidence indicates that at least three of the teenagers may have suffered from TB, two may have had meningitis, and one was likely malnourished due to disease or circumstance. One-quarter of the examined adolescents exhibit evidence of both early childhood stress and later disease, suggesting that acquired frailty made them more susceptible to disease in their teen years, at an age when the influence of sex hormones on the immune system had altered immune response strategy from containment to attack (Lewis 2018a:7). This immune activity is crucial in the development of adult-type TB, as excessive tissue necrosis creates a more favourable environment for the growth of *M. tuberculosis* bacilli (Marais *et al.* 2005). In some cases, the observed pattern of early-life stress followed by adolescent chronic disease and death may be evidence of survival of primary TB resulting in increased vulnerability to reactivated or reintroduced infection in puberty.

Six adolescents in the chronic illness group could be assigned to a general pubertal stage. Of these, only one, the 15.0-16.0-year-old of indeterminate sex from Burial 355, was pre-PHV or in the midst of PHV. The remaining five were post-PHV, either in the deceleration or maturation phase. Though the sample is small, it potentially lends support to McDade's (2003:118) hypothesis of immune function impairment in adolescents experiencing advanced stages of puberty, particularly those growing up in high pathogen, low resource environments.

Examination of spatial data found no pattern in the distribution of the ailing adolescents' graves, demonstrating that the results were not skewed by a group of individuals buried in a plot belonging to a single institution (e.g., TB sanatorium) or reserved for interment of the poor. Adolescents with evidence of chronic illness were not found in any of the identified family plots or probable family grave groupings, so no further information is available for specific individuals (Mack 2013d, f). However, the connection between historically documented diseases in Dubuque and observable skeletal pathology in adolescents is explored below.

7.8. A Midwestern Model for Adolescent Mortality

Both the City Cemetery records and the skeletal collection from the Third Street Cemetery represent cumulative burial populations spanning comparable time periods in the same Midwestern community. Historical evidence suggests that both Catholics and non-Catholics in Dubuque were exposed to the same hazards in daily life, with both populations including members of the upper class and the lowest ranks of the poor, and both experiencing the same demographic shifts (Mack 2013b:67). It is reasonable, then, to explore how the mortality profile of the 123 City Cemetery adolescents with known cause of death can be used to interpret evidence from the 43 adolescent skeletons excavated from Third Street.

7.8.1. OBSERVABLE CHRONIC DISEASE

The top three medical causes of death recorded for adolescents in the City Cemetery all have the potential to become chronic, and therefore could all potentially be observable on skeletal remains. In addition to TB, typhoid, and meningitis, relatively common diseases like pneumonia, bronchitis, and even malaria can also leave evidence on bones. The nature of these diseases and their prevalence among the general adolescent population of Dubuque are significant because the data can be used to predict/interpret osteological findings from the Third Street Cemetery population and other skeletal collections from nineteenth-century burial grounds.

The effects of TB on the human skeleton have been discussed at length in Chapter 4 and the first half of the current chapter. One issue that remains unresolved is the frequency of bony response to TB. Twentieth- and twenty-first-century clinical studies have found that between 1% and 5% of patients develop skeletal lesions, while children's bones and joints are affected in as many as 12% of cases (Bernard 2003; Lewis 2018a:156). However, these figures are largely representative of patients who were receiving treatment after the development of antibiotics in the 1940s (Roberts 2003:11). The manifestation of TB in untreated patients from an earlier era was likely more pronounced (Lewis 2018a:156). Additionally, the bony involvement recorded in these studies is restricted to that which causes clinical symptoms or is radiologically visible. Periosteal bone formation on the pleural surface of the rib would not be reported clinically or visible in x-rays. Santos and Roberts (2001) report finding periosteal new bone on the pleural surfaces of ribs from over 90% of the juveniles (7 to 21 years) documented with pulmonary tuberculosis in an anatomical skeletal collection, though rib periostosis can also be associated with pneumonia and bronchitis (Matos and Santos 2006). Unfortunately, the issue of prevalence of bony response to untreated TB remains unclear, though in sub-adults it could range from 12% to 90% of cases.

Though rarely discussed in bioarchaeological studies (likely due to its lack of pathognomonic lesions), typhoid fever can also take the form of a chronic disease which affects the bones. In a study of over 1,100 typhoid patients admitted to the hospital in Norway between 1912 and 1961, fever was found to last an average of 30 days, with a maximum of 138 days (Gadeholt and Madsen 1963). A relatively long-term infection can lead to anaemia of chronic disorders, which in turn may manifest as CO (Rivera and Lahr 2017). Such lesions would not appear in previously unaffected adolescents but could perhaps be reactivated in individuals who formed cribrotic lesions in childhood and failed to convert the red marrow of the orbits. Furthermore, periostitis was observed in 2.1% of cases in the Norwegian study, with the ribs and tibiae most commonly affected. Other locations included the clavicle, iliac crest, femur, fibula, and metacarpals/metatarsals. The appearance of periostitis symptoms was observed as early as the 22nd day of infection and as late as the 60th day. Additionally, one patient developed purulent typhoid arthritis of the cubital joint while another had staphylococcal periostitis (Gadeholt and Madsen 1963). Another mechanism which might lead to bony reaction is the coagulopathy frequently exhibited by untreated typhoid fever patients. Though this is often mild, it can develop into a generalised bleeding diathesis (Hornick and Greisman 1978). The potential for haemorrhages could lead to bone apposition similar to that seen in scurvy. Gross intestinal haemorrhage occurs in around 15% of untreated typhoid cases, with about a quarter of those resulting in death in the Norwegian study. Intestinal haemorrhage was rarely observed in patients under the age of 10 years. This age-related difference in disease manifestation may account for the sharp increase in typhoid mortality in the second decade of life (i.e., adolescence) (Gadeholt and Madsen 1963).

The association between meningitis and labyrinthine endocranial lesions has been discussed in Chapter 4, and the increased risk factors for adolescents and young adults are addressed in the first half of the current chapter. Acute meningitis kills individuals too quickly to cause bony reaction. However, patients with chronic meningitis are documented as living for a month, or up to a year, after infection (Lewis 2018a:144). Three individuals listed in the 1850 and 1860 Mortality Schedules for Dubuque reportedly exhibited symptoms for 10 days to two weeks before death. Exactly how long a patient must survive in order for lesions to form is unknown. The highly vascular bone of young sub-adults reacts more quickly to inflammatory stimuli (Lewis 2018a:144), but adolescent cranial bone reaction time is likely more similar to that of adults. Thus, the greater incidence of labyrinthine endocranial lesions observed in adolescents compared with adults in a skeletal collection would indicate the higher prevalence of meningitis among teenagers or a tendency for youths to survive the infection longer, rather than an age-related bias in the severity of bony reaction.

Malaria – also known as intermittent fever – was not a commonly recorded cause of death in Dubuque, and the infection does not directly affect an afflicted person's bones. However, the presence of the disease in the region, its sometimes-chronic nature, and its potential to indirectly affect the skeleton make malaria worthy of consideration in regards to this population. A low-grade, recurring infection may lead to CO through two mechanisms. Malaria in children can cause maldistribution of iron and suppression of erythropoiesis, which leads to hypocellular marrow and, potentially, CO. The effect of malaria on kidneys can lead to anaemia of chronic renal failure, which also results in erythropoiesis and hypocellularity (Lewis 2018a:198; Prentice *et al.* 2007; Rivera and Lahr 2017). Chronic malaria can also increase an individual's metabolic demand for vitamin C, while concomitant anaemia can cause vitamin C deficiency, potentially resulting in scurvy and periosteal new bone formation caused by small haemorrhages (Halcrow *et al.* 2014; Lewis 2018a:214-218). Cribrotic and scorbutic lesions cannot be directly tied to malaria without biomolecular study including immunological tests or DNA analysis (Sallares and Gomzi 2001), but the documented presence of the disease in a population constitutes another potential contributor to the prevalence of these chronic illness markers.

7.8.2. THE DUBUQUE CITY CEMETERY MODEL

Even when working with relatively detailed burial records such as those from the City Cemetery, it is difficult to predict the amount of skeletal pathology that would be observable if the graves were to be excavated. Regardless of the quality of bone preservation, there remains the confounding issue of the unknown ratio of disease prevalence to skeletal manifestation. Forty-two of the City Cemetery teens died from TB, pneumonia, and bronchitis, but how many would be expected to exhibit bone lesions? The number might be as high as 38, given the 90% observability of pulmonary disease on juvenile ribs reported by Santos and Roberts (2001), or perhaps 5, in accordance with the 12% of children (3-16 years) with reported skeletal involvement in Bernard's (2003) study. Given bioarchaeology's failure to identify large numbers of TB victims in cemeteries associated with periods of high infection rates (e.g., Richards *et al.* 2016), a prediction on the lower end of the range seems more realistic. The lack of clinical data regarding bone involvement rates for the other chronic diseases documented in the City Cemetery hampers further observability adjustments. Thus, the predictive model (Table 7.21) assumes that 100% of individuals who died from potentially chronic diseases (other than TB) may have suffered illness of sufficient duration and severity to affect the skeleton.

Table 7.21. Calculations of expected and observed skeletal evidence of chronic disease and trauma, based on documentation from the City Cemetery and human remains from the Third Street Cemetery. Expected numbers for TB/pulmonary disease based on 90% skeletal observability, with 12% observability in parentheses.

Cause of Death	Prevalence per 1,000, City Cemetery	# of adolescents observable, Third Street	# expected from Third Street sample	# observed in Third Street sample
TB/pulmonary disease	341	40	12-13 (1-2)	3
Typhoid fever	114	40	4-5	3
Meningitis	81	42	3-4	4
Malaria	8	42	0-1	N/A
All chronic disease (pooled)	544	40	20-22 (9-10)	10
Trauma	41	40	1-2	0

Table 7.21 presents the prevalence rates for the top three medical causes of death for adolescents in the City Cemetery, along with three additional chronic causes of death. The prevalence rates of two pulmonary diseases (pneumonia and bronchitis) are combined with TB, as the most common osteological observation, rib periostosis, might be linked to any of these three conditions. Malaria is included in the table as well, as a potential contributor to the occurrence of nonspecific skeletal lesions. Because most skeletal lesions observed in archaeological collections are not pathognomonic, the totalled prevalence of all chronic diseases pooled together is also presented for comparison with observations of specific and nonspecific lesions. The prevalence of external causes with trauma documented in the City Cemetery records (excluding drownings and unspecified accidents) is included at the bottom of the table. The prevalence rate per 1,000 in the second column is based on the number of adolescents with a given cause of death and the overall number

of adolescents in the City Cemetery records. The next column gives the number of adolescents from the Third Street Cemetery who were observable for each disease. The cranial remains of 42 individuals were relatively complete, while postcranial remains were sufficiently complete for 40 individuals.

As discussed above, the number of skeletons expected to exhibit bone lesions (column #4) has been adjusted for TB and other pulmonary diseases. The direct application of the 341 per 1,000 prevalence rate to the 40 Third Street teenagers would result in a prediction of 13 to 14 adolescents with evidence of pulmonary disease. However, since the highest reported observability is 90%, the expected number in the Third Street sample is 12 to 13 instead. A more conservative estimate, using 12% observability, is given in parentheses. The expected numbers for typhoid fever, meningitis, malaria, and trauma are calculated using the simple prevalence per 1,000, rounding to whole numbers. The expected number for all chronic diseases (pooled) adds the 90%/12% expected TB victims to the number derived from the prevalence rates for the other chronic diseases.

Somewhere between one and thirteen adolescent skeletons from the Third Street Cemetery were expected to exhibit evidence of TB or other pulmonary disease. In the final column of Table 7.21, the number of individuals actually observed with rib lesions – three – is given. Three individuals with nonfocal periosteal new bone formation and no other active lesions at the time of death are considered possible typhoid fever victims, though the identification is tenuous. Six adolescents exhibit labyrinthine endocranial lesions, but two of these individuals also present with rib periostitis, leaving only four who potentially died from meningitis. Since lesions which might be associated with chronic malaria are nonspecific, no attempt was made to identify malaria victims among the remains from Third Street. Altogether, 10 adolescents were found to exhibit evidence of active bony reaction to chronic disease at the time of death. Five additional adolescents with CO or PH only were excluded from these results, as their lesions were healing/healed at the time of death (or else the status was not specified by the skeletal analyst and cannot be verified in photographs). None of the adolescents from Third Street exhibits perimortem trauma. The numbers of expected/observed individuals generated by the application of the Dubuque City Cemetery model to the Third Street adolescent population are too small for statistical analysis using a chi-square goodness-of-fit test. Nevertheless, the total number of adolescents observed with evidence of chronic disease, 10, falls squarely within the range of expectation based on the lower prevalence of skeletal manifestations of TB, 9 to 10.

Given the difficulty of identifying bacterial meningitis versus meningitis secondary to other diseases, and the improbability of identifying individuals who died of typhoid fever and malaria, a more streamlined model is proposed (Table 7.22). This simplified model employs the likely range of skeletally observable prevalence for TB and pulmonary diseases (90%/12%) and pools the additional chronic disease rates. The model is applied to data from the comparative cemeteries in Chapter 8, with pooled numbers sufficiently large to allow statistical analysis.

Table 7.22. Blank Midwestern model for skeletally observable evidence of chronic disease and trauma among adolescents. Prevalence figures based on City Cemetery records.

Cause of Death	Observable prevalence per 1,000, City Cem.	# of adolescent skeletons observable	# expected	# observed
TB/pulmonary disease	307 (41)			
Other chronic disease	203			
Trauma	41			

7.9. Summary

Due to the limited available information pertaining to burials at the Third Street Cemetery, mortality trends for the community were explored instead using detailed entries in the nondenominational Dubuque City Cemetery records. In combination with census data, these records reveal that, despite the low numbers of adolescent skeletons at Third Street, the community mortality rate for teenagers was not significantly lower than that of children and adults. The top four causes of death reported for adolescents in the City Cemetery were TB, accidents, typhoid fever, and meningitis, which together account for two-thirds of the recorded adolescent deaths. The teenage population suffered significantly more deaths from accidents/ external causes than all other age groups. In addition to age, sex contributed to the heterogeneity of risk associated with accidental death, likely due to habitual activities among teenage males particularly in regards to aquatic recreation.

The excavated Third Street Cemetery sample includes the remains of 43 individuals (16 female, 9 male, 18 indeterminate) whose skeletal development falls within the range of osteological adolescence (12-20 years), and whose biological development spans the range from pre- to post-PHV. Without accurate sex determinations it is impossible to be certain, but most of these individuals likely qualified as social adolescents according to the standards in their community, 13 to 18 years for females and 15 to 19 years for males.

Frequencies of six markers of stress, disease, and trauma observed in the Third Street collection were separately compared between age classes (infant, child, adolescent, and adult). Adolescents exhibited no significant differences except for a greater occurrence of labyrinthine endocranial lesions when compared to adults, a prevalence unlikely to be explained by the reactivity of paediatric bone, as adolescent cranial cortex is more similar to adult bone. Perimortem trauma was not observed on adolescent remains, an unexpected finding given the high rate of accidental death among Dubuque’s teenagers. This absence may be explained by the large proportion of accidental deaths documented as drownings. No correlations were found between occurrences of individual pathological markers in adolescents or in the sample at large.

A comparison of individuals displaying evidence of early childhood stress and illness as well as additional or perimortem markers of chronic disease found that the ratio of adolescents with this combination was significantly higher than that of any other age class. These findings suggest that individuals who acquired frailty due to childhood health insults were more likely to succumb to chronic disease in adolescence, while their stronger peers lived into adulthood. Survival of primary TB in early childhood may have left some individuals more vulnerable when the disease was reactivated or when new bacilli were introduced during puberty.

Uncertainty concerning the rates at which diseases like TB, typhoid, and meningitis manifest with bone lesions hinders the creation of a precision model to interpret skeletal markers of chronic illness based on documentary records. A simplified model (Table 7.22) predicts only the expected range of skeletally-observable adolescent cases of TB/pulmonary disease, nonspecific chronic diseases, and perimortem trauma within a given archaeological population, based on data from the City Cemetery records. When this model is applied to the Third Street population, the number of adolescents exhibiting skeletal evidence of any chronic illness (n=10) falls within the range predicted by the model, but the one or two teenagers expected with perimortem trauma were not found in the excavated portion of the cemetery. In the following chapter, the applicability of the Midwestern Model to nineteenth-century burial populations in other regions of the United States will be explored.

Chapter 8

Bioarchaeology, Palaeopathology, and Adolescent Mortality Trends at Other Nineteenth Century American Cemeteries

8.1. The Comparative Cemetery Samples

To further explore the adolescent pathology and mortality trends observed in the Third Street Cemetery population, 10 cemeteries were selected to provide comparative data. These cemeteries were chosen based on three primary criteria: the use periods were roughly contemporary with the Third Street Cemetery, adolescents were identified in the burial populations, and the archaeological projects involved detailed documentation of the excavation and/or analyses. Additionally, an effort was made to include burial grounds representing multiple regions of the U.S. and diverse religious and cultural backgrounds, including both Protestants and Catholics, and Euroamericans, African-Americans, Hispanics, and Native Americans. Unfortunately, not all of the selected cemeteries provided reliable comparable osteological data. The author encountered a range of issues – both expected and unexpected – concerning osteological analyses, including narrow project parameters (field analysis only), project cancellation (excavation halted due to legal proceedings), inexpert analysis (resulting in impossibly high pathology rates), and the mysterious disappearance of osteological data from the Alameda-Stone project. These limitations resulted in the reduction of the number of cemeteries used for comparative osteological data to eight, with three providing only partial data. Table 8.1 lists the comparative cemeteries, their locations and dates of use, and the number of excavated individuals, divided by age class. The final column gives the percentage of interments containing adolescent remains. Please refer to Chapter 5 of this volume for detailed descriptions of the cemeteries and a map showing their locations (Figure 5.1).

Table 8.1. List of excavated cemeteries used for comparative osteological data, with locations and date ranges included. The number of age-identifiable interments is given, divided by age class. The percentage of observable interments containing adolescent individuals is found in the last column.

Cemetery	**Location**	**Active Period**	**# of Infants**	**# of Children**	**# of Adolescents**	**# of Adults**	**TOTAL #**	**Adolescent pop. %**
Second Catholic Graveyard	St. Louis, Missouri	1824-1850s	23	7	3	46	79	3.8
Voegtly Cemetery	Pittsburgh, Pennsylvania	1833-1861	408	83	19	176	686	2.8
Grafton Cemetery	Grafton, Illinois	1834-1873	86	41	18	101	246	7.3
Alameda-Stone Cemetery[1]	Tucson, Arizona	1860s-1875	382	89	38	418	927	4.1
Freedman Cemetery	Dallas, Texas	1869-1907	420	53	56	602	1131	5.0
Avondale Burial Place	Bibb County, Georgia	1869-1935	40	20	3	36	99	3.0
Dove Cemetery	Atascadero, California	1870s-1890s	3	1	1	12	17	5.9
Milwaukee County Poor Farm Cemetery (MCPFC)[2]	Wauwatosa, Wisconsin	1882-1925	259	2	13	338	612	2.1
TOTAL:			1621	296	151	1729	3797	4.0

1 The military section of the Alameda-Stone Cemetery was excluded from these analyses, as the graves had been previously exhumed. The paucity of human remains left behind prevented accurate age assessments (adolescent vs. adult).

2 This sample includes only remains recovered during the excavation in 2013. Though Milligan (2010) looked at many of the same skeletal markers in her investigation of public health using the collection from the original MCPFC excavation in the 1990s (n=923), her data were not applicable to the current study as all sub-adults were grouped together in her results. Furthermore, her broad juvenile category (5 to 19.9 years) included only seven individuals.

With the exception of individuals from the Milwaukee County Poor Farm Cemetery (MCPFC), adolescent age estimates for the comparative sample could not be independently verified, and pubertal stage could not be estimated due to a lack of detailed epiphyseal fusion information. The completeness scores assigned in the project database to some of the cranial and postcranial remains in the comparative samples are not as reliable as those given for Third Street individuals. In some cases, the available skeletal inventories were vague (e.g., Freedman Cemetery), while in others, skeletal completeness could only be estimated based on field photographs or drawings (e.g., Alameda-Stone Cemetery). However, the completeness coding for the Third Street sample was intentionally kept general, rather than considering both completeness and bone quality, so that the datasets would be comparable.

8.2. Observations of Pathology in the Comparative Sample

Observations of pathological bone on skeletal remains recovered from the comparative cemeteries were gleaned from published burial descriptions, analysis spreadsheets, handwritten osteological coding forms, and, in the case of the adolescents from the MCPFC, direct observation of the remains by the author. In the sections below, where specific publications are not cited in the tables as sources for pathology data, information was gathered from unpublished sources. These pathological findings were entered into a database identical to that used for the Third Street individuals; for raw data, please see Appendix D. If accessing this thesis digitally, please contact the author or the University of Iowa Office of the State Archaeologist for Appendix D.

Subsequent analysis followed the same sequence used for the primary study population. To determine whether or not age-related differences exist in the frequency rates of the six selected markers of stress, disease, and trauma, the counts for each marker were first considered separately. Following this analysis, the observations were grouped into two categories. The first category includes the early-life stress markers (LEH and cribra orbitalia/porotic hyperostosis) which may indicate perimortem illness among infants and young children or a previous episode of ill health among older individuals. The second category includes labyrinthine endocranial lesions, nonfocal periosteal new bone formation, tubercular lesions, and unhealed trauma, all of which could potentially be related to cause of death for individuals of any age.

8.2.1. LINEAR ENAMEL HYPOPLASIAS (LEH)

Unfortunately, consistent LEH observations are not available for two of the largest burial populations, Alameda-Stone and Freedman Cemeteries. Though hypoplasias were often recorded when present, the loss of dental inventories demonstrating which individuals were and were not observable for anterior LEH renders the available data unusable for the current analysis. Additionally, hypoplasia analysis of the Second Catholic Graveyard population did not include infants or children. Thus, presence or absence of LEH could be scored for only 797 individuals from the comparative samples (Table 8.2).

Table 8.2. Number of individuals from the comparative samples observed with LEH absent/present, divided by age class. Cemeteries are arranged chronologically, oldest to most recent.

Age Class	# observable for LEH	# without LEH	# with LEH	% with LEH
Second Catholic Graveyard, St. Louis, Missouri, 1824-1850s (unpublished data)				
Infant	n/a	n/a	n/a	n/a
Child	n/a	n/a	n/a	n/a
Adolescent	*3*	*2*	*1*	*33.3*
Adult	34	24	10	29.4
Total:	37	26	11	29.7
Voegtly Cemetery, Pittsburgh, Pennsylvania, 1833-1861 (Ubelaker and Jones 2003)				
Infant	149	143	6	4.0
Child (3-7 yrs)	34	24	10	29.4
Child (7-12 yrs)	23	18	5	21.7
Adolescent	*18*	*13*	*5*	*27.8*
Adult	110	89	21	19.1
Total:	334	287	47	14.1
Grafton Cemetery, Grafton, Illinois, 1834-1873 (unpublished data)				
Infant	4	4	0	0.0
Child (3-7 yrs)	11	8	3	27.3
Child (7-12 yrs)	7	3	4	57.1
Adolescent	*11*	*5*	*6*	*54.5*
Adult	64	42	22	34.4
Total:	97	62	35	36.1

Table 8.2., continued.

Age Class	# observable for LEH	# without LEH	# with LEH	% with LEH
Avondale Burial Place, Bibb County, Georgia, 1869-1935 (Matternes *et al.* 2012b)				
Infant	5	5	0	0.0
Child (3-7 yrs)	3	3	0	0.0
Child (7-12 yrs)	4	1	3	75.0
Adolescent	*3*	*1*	*2*	*66.7*
Adult	19	16	3	15.8
Total:	34	26	8	23.5
Dove Cemetery, Atascadero, California, 1870s-1890s (Sewell and Stanton 2008)				
Infant	3	3	0	0.0
Child (3-7 yrs)	1	1	0	0.0
Adolescent	*1*	*1*	*0*	*0.0*
Adult	11	9	2	18.2
Total:	16	14	2	12.5
Milwaukee County Poor Farm Cemetery, Wauwatosa, Wisconsin, 1882-1925 (Richards *et al.* 2016 and unpublished data)				
Infant	71	70	1	1.4
Child (7-12 yrs)	1	0	1	100.0
Adolescent	*10*	*5*	*5*	*50.0*
Adult	197	145	52	26.4
Total:	279	220	59	21.1
Totals (Pooled sample)				
Infant	232	225	7	3.0
Child (3-7 yrs)	49	36	13	26.5
Child (7-12 yrs)	35	22	13	37.1
Adolescent	*46*	*27*	*19*	*41.3*
Adult	435	325	110	25.3
Total:	797	636	162	20.3

In all of the cemetery samples, infants exhibit the lowest incidence of LEH. Because the anterior teeth of infants and young children are still forming, those individuals who died before the age of around 6.5 to 7.0 years had not yet lived through the full window of opportunity for hypoplasia formation. Therefore, only the results from older children (tallied separately in Table 8.2), adolescents, and adults are truly comparable. In four of the six populations, older children and adolescents appear to exhibit higher frequencies of LEH than adults, though the sample sizes are too small for statistical analysis. The pooled sample, however, is sufficient for a chi-square comparison of older children and adolescents (non-survivors) with adults (individuals who survived childhood). This analysis indicates that adolescents in the pooled cemetery populations exhibited LEH significantly more frequently than older children and adults ($\chi^2=7.094$, df=2, p=0.029), though the standardized residual of 1.8 (rather than 2.0+) makes this finding only suggestive, rather than definitive.

Pooling of data may not be appropriate for these osteological results, given the broad geographic and temporal range of the samples. However, when the very small sample from Dove is eliminated, a possible temporal pattern emerges. Along with the Third Street Cemetery (Table 7.11, p. 166), the other two earliest burial populations – from the Second Catholic and Voegtly Cemeteries – were found to have roughly equal rates of LEH between non-survivor older children, adolescents, and adults. Meanwhile, the later populations from Avondale and the MCPFC exhibit higher rates among non-survivors than those who survived to adulthood. This evidence suggests two possibilities. The first scenario indicates that living conditions were deteriorating as the century progressed and that children weakened by LEH-causing health insults were more likely to die before reaching adulthood whereas earlier in the century, they had an equal chance of survival. Alternatively, living conditions may have been improving, and thus more infants and young children survived certain health insults (resulting in LEH) which previously may have been fatal, though these marked individuals succumbed in greater numbers in later childhood and adolescence. This second scenario is more likely given the historically reported decline in infant and child mortality in the U.S. population at large in the late nineteenth and early twentieth centuries, due in part to the regulation of market milk (Lee 2007). The Grafton sample fits the pattern of the two later burial grounds, though it is contemporary with and regionally similar to Third Street, which suggests that the infectious disease load and vulnerability to nutritional stresses experienced by sub-adults was specific to communities rather than necessarily following national trends.

8.2.2. CRIBRA ORBITALIA AND POROTIC HYPEROSTOSIS

From the eight cemetery samples, 2,485 individuals had crania coded complete enough for the observation of cribra orbitalia (CO) and porotic hyperostosis (PH) (Table 8.3). Out of that sample, 246 individuals were reported with CO, PH, or both manifestations. Being that CO is relatively distinctive, these pathological observations are likely reliable, though it is unfortunate that the coding method of Stuart-Macadam (1991) was not employed for consistent recording. Observations of PH, on the other hand, can vary widely in accuracy, with some inexperienced analysts recording all porosity of the ectocranial surface as PH (Grauer 2019:515). However, the relatively low numbers of individuals reported with CO/PH and the similarities in age distribution suggest conservative, largely reliable recording.

Table 8.3. Number of individuals from the comparative sample observed with cribra orbitalia and/or porotic hyperostosis (CO/PH) absent/present, divided by age class. Cemeteries are arranged chronologically, oldest to most recent.

Age Class	# observable for CO/PH	# without CO/PH	# with CO/PH	% with CO/PH
Second Catholic Graveyard, St. Louis, Missouri, 1824-1850s (Harl *et al.* 1996)				
Infant	15	15	0	0.0
Child	6	4	2	33.3
Adolescent	*3*	*2*	*1*	*33.3*
Adult	42	41	1	2.4
Total:	66	62	4	6.1
Voegtly Cemetery, Pittsburgh, Pennsylvania, 1833-1861 (Ubelaker and Jones 2003)				
Infant	36	35	1	2.8
Child	34	28	6	17.6
Adolescent	*17*	*15*	*2*	*11.8*
Adult	131	129	2	1.5
Total:	218	207	11	5.0
Grafton Cemetery, Grafton, Illinois, 1834-1873 (Buikstra *et al.* 1996)				
Infant	0	n/a	n/a	n/a
Child	2	1	1	50.0
Adolescent	*6*	*4*	*2*	*33.3*
Adult	42	40	2	4.8
Total:	50	45	5	11.1
Alameda-Stone Cemetery, Tucson, Arizona, 1860s-1875 (Heilen and Gray 2010b and unpublished data)				
Infant	364	332	32	8.8
Child	85	77	8	9.4
Adolescent	*37*	*33*	*4*	*10.8*
Adult	393	380	13	3.3
Total:	879	822	57	6.5

Table 8.3., continued.

Age Class	# observable for CO/PH	# without CO/PH	# with CO/PH	% with CO/PH
Freedman Cemetery, Dallas, Texas, 1869-1907 (Peter *et al.* 2000, Appendix E)				
Infant	126	117	9	7.1
Child	43	38	5	11.6
Adolescent	*45*	*41*	*4*	*8.9*
Adult	502	459	43	8.6
Total:	716	655	61	8.5
Avondale Burial Place, Bibb County, Georgia, 1869-1935 (Matternes *et al.* 2012b)				
Infant	1	1	0	0.0
Child	6	5	1	16.7
Adolescent	*2*	*2*	*0*	*0.0*
Adult	25	25	0	0.0
Total:	34	33	1	0.3
Dove Cemetery, Atascadero, California, 1870s-1890s (Sewell and Stanton 2008)				
Infant	2	2	0	0.0
Child	1	1	0	0.0
Adolescent	*1*	*1*	*0*	*0.0*
Adult	12	12	0	0.0
Total:	16	16	0	0.0
Milwaukee County Poor Farm Cemetery, Wauwatosa, Wisconsin, 1882-1925 (Richards *et al.* 2016 and unpublished data)				
Infant	196	170	26	13.3
Child	2	2	0	0.0
Adolescent	*11*	*8*	*3*	*27.3*
Adult	297	219	78	26.3
Total:	506	399	107	21.1
Totals (Pooled sample)				
Infant	740	672	68	9.2
Child	179	156	23	12.8
Adolescent	*122*	*106*	*16*	*13.1*
Adult	1444	1305	139	9.6
Total:	2485	2239	246	9.9

As noted with the Third Street sample (Table 7.13, p.170), the age distribution is, to some extent, determined by the nature of the lesion, with children and adolescents the most affected, generally followed by infants and then adults. Individuals in the child category lived for more years than those in the infant category, and thus had a greater window of opportunity to develop these lesions in response to chronic illness or malnutrition before the cranial vault ceased to be involved in hematopoiesis

(Brickley 2018; Lewis 2018:194). Data from the comparative cemeteries sometimes failed to specify whether the lesion was active or not at the time of death, but for the current project, it was assumed that CO/PH lesions observed on adolescent and adult remains were healing or healed. These older individuals had survived the active period of the lesion, unlike the many children who succumbed to various CO and PH-causing conditions. The question, then, is whether or not these survivors were more likely to fall in adolescence or endure into adulthood. The answer is likely dependent on precisely what type of health insult was survived, information which is not available in the majority of reported CO and PH cases. The results of the pooled sample indicate no difference in survivorship for adolescents and adults with these lesions, a trend clear in the later cemeteries. Though earlier populations (e.g., Second Catholic and Grafton samples) have widely divergent rates for adolescents and adults, the low numbers of cases prevent reliable statistical analyses.

8.2.3. LABYRINTHINE ENDOCRANIAL LESIONS

Endocranial lesions were not reported for the Freedman Cemetery population, so these individuals were excluded from this analysis. Recorded observations from the MCPFC included arachnoid fovea, enlarged meningeal grooves, and taphonomic damage in the category of endocranial lesions.[1] The author had the opportunity to examine 49 of the MCPFC individuals reported with endocranial lesions and eliminated all but six. However, the possibility that unreported lesions might exist on crania that were not re-examined led the author to exclude these individuals from the tallies below. Observations from only 1,263 relatively complete crania from the six remaining populations were included.

Labyrinthine endocranial lesions were rare or non-existent in the comparative samples (Table 8.4; see Table 7.14, p. 171 for Third Street data). Only the Voegtly and Alameda-Stone populations had reported cases, with two and 44 individuals affected, respectively. The rate of lesion occurrence at Alameda-Stone decreased with age, with infants exhibiting the highest frequency and adults the lowest. As previously

1 Most skeletal remains from the 2013 excavation of the MCPFC have undergone only preliminary analysis, primarily performed by students. Pathology coding forms created during this work were intended to serve as guides for further investigation rather than indicating completed pathology evaluation, circumstances which were unknown to the author at the outset of the current project.

noted, the greater frequency among sub-adults is consistent with observations of other skeletal collections and is likely due to the responsive nature of paediatric bone (Lewis 2004; Shultz 2001). Additionally, it is possible that these lesions remodel so completely that earlier episodes become invisible or are easily overlooked in adult remains. The complete absence of cases from the remaining four cemetery likely relates to sample size, as these comprise the smallest burial populations.

Table 8.4. Number of individuals from the comparative sample observed with labyrinthine endocranial lesions absent/present, divided by age class. Cemeteries are arranged chronologically, oldest to most recent.

Age Class	# observable for endocranial lesions	# without endocranial lesions	# with endocranial lesions	% with endocranial lesions
Second Catholic Graveyard, St. Louis, Missouri, 1824-1850s (Harl *et al.* 1996)				
Infant	15	15	0	0.0
Child	6	6	0	0.0
Adolescent	*3*	*3*	*0*	*0.0*
Adult	42	42	0	0.0
Total:	66	66	0	0.0
Voegtly Cemetery, Pittsburgh, Pennsylvania, 1833-1861 (Ubelaker and Jones 2003)				
Infant	36	35	1	2.8
Child	34	34	0	0.0
Adolescent	*17*	*16*	*1*	*5.9*
Adult	131	131	0	0.0
Total:	218	216	2	0.9
Grafton Cemetery, Grafton, Illinois, 1834-1873 (Buikstra *et al.* 1996)				
Infant	0	n/a	n/a	n/a
Child	2	2	0	0.0
Adolescent	*6*	*6*	*0*	*0.0*
Adult	42	42	0	0.0
Total:	50	50	0	0.0
Alameda-Stone Cemetery, Tucson, Arizona, 1860s-1875 (Heilen and Gray 2010b and unpublished data)				
Infant	364	328	36	9.9
Child	85	79	6	7.1
Adolescent	*37*	*36*	*1*	*2.7*
Adult	393	392	1	0.3
Total:	879	835	44	5.0

Table 8.4., continued.

Age Class	# observable for endocranial lesions	# without endocranial lesions	# with endocranial lesions	% with endocranial lesions
Avondale Burial Place, Bibb County, Georgia, 1869-1935 (Matternes *et al.* 2012b)				
Infant	1	1	0	0.0
Child	6	6	0	0.0
Adolescent	*2*	*2*	*0*	*0.0*
Adult	25	25	0	0.0
Total:	34	34	0	0.0
Dove Cemetery, Atascadero, California, 1870s-1890s (Sewell and Stanton 2008)				
Infant	2	2	0	0.0
Child	1	1	0	0.0
Adolescent	*1*	*1*	*0*	*0.0*
Adult	12	12	0	0.0
Total:	16	16	0	0.0
Totals (Pooled sample)				
Infant	418	381	37	8.9
Child	134	128	6	4.5
Adolescent	*66*	*64*	*2*	*3.0*
Adult	645	644	1	0.2
Total:	1263	1217	46	3.6

8.2.4. NONFOCAL PERIOSTEAL NEW BONE FORMATION

Two large burial populations were also excluded from the skeletal sample considered in the discussion of periosteal new bone formation. The original analysis for Freedman Cemetery recorded periostitis on 323 out of 620 observable tibiae, an improbable 52%. Out of 81 infants with good preservation of postcranial remains, 35 were reported with periostitis, including 10 individuals with new bone recorded on more than 10 – and sometimes all – elements. The bioarchaeological report (see Peter *et al.* 2000) was written by an osteologist not involved in the lab work, based exclusively on incomplete analysis forms and low-quality photographs. Comments made by the osteologist, both in the published report and in the pathology database, indicate that the frantic nature of the project led to the use of inexpert personnel for the original analysis, with unfortunate consequences for the quality of the data. Due to the rush to rebury, these remains were not available for re-examination by the original report author or the current author. Reported prevalence of periostosis in the

MCPFC population is not impossibly high. However, several infants with extensive pathology reported were examined by the author and found to exhibit only normal bone growth, while other recorded cases of bone apposition turned out to be adhering soil or taphonomic damage. Because re-analysis of all 517 relatively complete individuals in the MCPFC collection was outside the scope of the current project, this population was excluded from the data as well. In the author's experience, sub-adult bone growth (especially at metaphyses) and the normal striae that appear on adult tibial diaphyses are sometimes misidentified as mild active or remodelled periosteal new bone formation related to pathological processes (see Ortner 2012). These mistakes are less common in the analysis of adolescent remains which exhibit less growth-related bone formation.

The number of individuals observable for periosteal new bone formation from the remaining six cemeteries totals 1,203 (Table 8.5; see Table 7.15, p. 173 for Third Street data). Only two adolescents, out of 60 observable, exhibited diffuse, nonfocal periosteal lesions. A 14- to 16-year-old buried at Alameda-Stone exhibited bone growth on the left mandibular alveolus and the lateral surface of the right humeral diaphysis, while a 13- to 14-year-old from Voegtly Cemetery displayed periosteal new bone on the medial surfaces of both femora. These kinds of lesions appear to have been more prevalent in infants and adults than children and adolescents, but the low numbers make statistical analysis unreliable.

Table 8.5. Number of individuals from the comparative sample observed with nonfocal periosteal new bone formation affecting more than one element absent/present, divided by age class. Cemeteries are arranged chronologically, oldest to most recent.

Age Class	**# observable for nonfocal periosteal new bone formation**	**# without periosteal new bone**	**# with periosteal new bone**	**% with periosteal new bone**
Second Catholic Graveyard, St. Louis, Missouri, 1824-1850s (Harl *et al.* 1996)				
Infant	11	10	1	9.1
Child	5	5	0	0.0
Adolescent	*3*	*3*	*0*	*0.0*
Adult	38	36	2	5.3
Total:	57	54	3	5.3

Table 8.5., continued.

Age Class	# observable for nonfocal periosteal new bone formation	# without periosteal new bone	# with periosteal new bone	% with periosteal new bone
Voegtly Cemetery, Pittsburgh, Pennsylvania, 1833-1861 (Ubelaker and Jones 2003)				
Infant	14	14	0	0.0
Child	15	15	0	0.0
Adolescent	*13*	*12*	*1*	*7.7*
Adult	122	116	6	4.9
Total:	164	157	7	4.3
Grafton Cemetery, Grafton, Illinois, 1834-1873 (Buikstra *et al.* 1996 and unpublished data)				
Infant	0	n/a	n/a	n/a
Child	2	2	0	0.0
Adolescent	*4*	*1*	*0*	*0.0*
Adult	44	20	4	9.1
Total:	50	23	4	8.0
Alameda-Stone Cemetery, Tucson, Arizona, 1860s-1875 (Heilen and Gray 2010b and unpublished data)				
Infant	363	322	41	11.3
Child	86	83	3	3.5
Adolescent	*37*	*36*	*1*	*2.7*
Adult	409	355	54	13.2
Total:	895	796	99	11.1
Avondale Burial Place, Bibb County, Georgia, 1869-1935 (Matternes *et al.* 2012b)				
Infant	0	n/a	n/a	n/a
Child	2	2	0	0.0
Adolescent	*2*	*2*	*0*	*0.0*
Adult	17	17	0	0.0
Total:	21	21	0	0.0
Dove Cemetery, Atascadero, California, 1870s-1890s (Sewell and Stanton 2008)				
Infant	2	2	0	0.0
Child	1	1	0	0.0
Adolescent	*1*	*1*	*0*	*0.0*
Adult	12	12	0	0.0
Total:	16	16	0	0.0
Totals (Pooled sample)				
Infant	390	348	42	10.8
Child	111	108	3	2.7
Adolescent	*60*	*58*	*2*	*3.3*
Adult	642	576	66	10.3
Total:	1203	1090	113	9.4

8.2.5. SKELETAL MARKERS OF TUBERCULOSIS/PULMONARY DISEASE

Of the relatively intact skeletons, 2,346 had sufficient representation of postcranial elements for observation of the presence or absence of skeletal markers commonly associated with tuberculosis (TB) and pulmonary disease (Table 8.6). Despite previously expressed reservations regarding the misidentification of pathological bone by some analysts working on the Freedman Cemetery and MCPFC collections, these populations are included in the analysis, as many of the reported cases include detailed descriptions which bolster the identification of TB or pulmonary disease. An adult female (Burial 497) from Freedman exhibits destruction of the second and third lumbar vertebral bodies, while an adult male (Burial 588) has possible mastoiditis along with periosteal new bone formation on the pleural surfaces of several ribs, both strongly suggesting TB. The ossified pleura found with an adult female from the MCPFC (Burial 10303) and the periosteal bone formation of the ribs observed on an adult male (Burial 10940) could point to TB or another respiratory condition. The periosteal bone found on the sternal ends of the ribs of an infant and adult male from Freedman, however, most likely point to a non-TB pulmonary illness (Matos and Santos 2006).

The remainder of possible TB cases from Freedman Cemetery, as well as twelve from Alameda-Stone and one each from the Second Catholic and Voegtly Cemeteries involve non-pathognomonic periosteal new bone formation on the pleural rib surfaces. Of the other six cases from Alameda-Stone, one was likely related to a different respiratory disease, as the sternal ends of the ribs were affected (Burial 18655). Two individuals, a 10- to 12-year-old child (Burial 28294) and an adult male (Burial 25345) with bone formation on the ribs, may have developed TB or another lung disease secondary to syphilis, which was advanced in the adult and congenital in the child (based on dental morphology). A young adult female (Burial 19965) was identified by the original analysts as exhibiting rhinomaxillary changes associated with *lupus vulgaris.* The adult male in Burial 18723 exhibits a cavitating lesion in the fifth lumbar body and a healing lesion of L4; without a more detailed description, though, a diagnosis of TB is uncertain. Tuberculosis dactylitis (*spina ventosa*) is the likely cause of sheath-like new bone growth on two carpal phalanges, one tarsal phalanx, and numerous left tarsals and metatarsals from a 6- to 10-year-old child

(Burial 28511). TB was confirmed in three adults from Voegtly – one with a lytic lesion of the third cervical body (Burial 32), one with a calcified lymph node (Burial 629), and one with periosteal new bone formation of the pleural rib surface and bone apposition in the maxillary sinus (Burial 706) – through the recovery of mycobacterial DNA (Ubelaker and Jones 2003:45).

In contrast with the Third Street Cemetery (Table 7.16, p. 174), where teenagers had the highest prevalence of possible TB lesions, the comparative samples yielded just one potential adolescent TB case, a 14- to 16-year-old of indeterminate sex from Alameda-Stone (Burial 16586). This individual exhibited periosteal new bone formation on the pleural surfaces of the second through sixth left ribs, as well as the left tibia. Very few infants were identified with possible TB or pulmonary disease lesions, which is to be expected, given that primary TB lesions tend to heal quickly or else result in acute, fatal infections (Roberts 2012:435). The relatively high rate of lesions among children in the comparative sample may be related to the greater tendency for bone involvement in sub-adult TB, as seen in Bernard's (2003) study of records from the Stannington sanitorium. The adult form of secondary TB can appear as soon as an individual reaches puberty (Marais 2005:83), a developmental stage which significantly impacts the body's immune system, making it vulnerable to both re-activation and new TB infection (McDade 2003). Even given the low expected rate of skeletal involvement with TB, the lack of evidence for adolescents is surprising, particularly in the MCPFC sample, as cemetery burial records (1882-1925) list TB as the leading infectious cause of death (Richards *et al*. 2016:31).

Table 8.6. Number of individuals from the comparative sample observed with skeletal markers of tuberculosis (TB) or pulmonary disease, divided by age class. Cemeteries are arranged chronologically, oldest to most recent.

Age Class	# observable for possible TB lesions	# without possible TB lesions	# with possible TB lesions	% with possible TB lesions
Second Catholic Graveyard, St. Louis, Missouri, 1824-1850s (Harl *et al.* 1996)				
Infant	11	11	0	0.0
Child	5	5	0	0.0
Adolescent	*3*	*3*	*0*	*0.0*
Adult	38	37	1	2.6
Total:	57	56	1	1.8
Voegtly Cemetery, Pittsburgh, Pennsylvania, 1833-1861 (Ubelaker and Jones 2003)				
Infant	14	14	0	0.0
Child	15	14	1	6.7
Adolescent	*13*	*13*	*0*	*0.0*
Adult	122	119	3	2.5
Total:	164	160	4	2.4
Grafton Cemetery, Grafton, Illinois, 1834-1873 (Buikstra *et al.* 1996)				
Infant	0	n/a	n/a	n/a
Child	2	2	0	0.0
Adolescent	*3*	*3*	*0*	*0.0*
Adult	41	41	0	0.0
Total:	46	46	0	0.0
Alameda-Stone Cemetery, Tucson, Arizona, 1860s-1875 (Heilen and Gray 2010b and unpublished data)				
Infant	363	363	0	0.0
Child	86	84	2	2.3
Adolescent	*37*	*36*	*1*	*2.7*
Adult	409	384	15	3.7
Total:	895	877	18	2.0
Freedman Cemetery, Dallas, Texas, 1869-1907 (Peter et al. 2000, Appendix E)				
Infant	81	77	4	4.9
Child	36	32	4	11.1
Adolescent	*41*	*41*	*0*	*0.0*
Adult	468	452	16	3.4
Total:	626	602	24	3.8
Avondale Burial Place, Bibb County, Georgia, 1869-1935 (Matternes *et al.* 2012b)				
Infant	0	n/a	n/a	n/a
Child	2	2	0	0.0
Adolescent	*2*	*2*	*0*	*0.0*
Adult	17	17	0	0.0
Total:	21	21	0	0.0

Table 8.6., continued.

Age Class	# observable for possible TB lesions	# without possible TB lesions	# with possible TB lesions	% with possible TB lesions
Dove Cemetery, Atascadero, California, 1870s-1890s (Sewell and Stanton 2008)				
Infant	2	2	0	0.0
Child	1	1	0	0.0
Adolescent	*1*	*1*	*0*	*0.0*
Adult	12	12	0	0.0
Total:	16	16	0	0.0
Milwaukee County Poor Farm Cemetery, Wauwatosa, Wisconsin, 1882-1925 (Richards *et al.* 2016 and unpublished data)				
Infant	181	181	0	0.0
Child	2	2	0	0.0
Adolescent	*12*	*12*	*0*	*0.0*
Adult	322	320	2	0.6
Total:	517	515	2	0.4
Totals (Pooled sample)				
Infant	652	648	4	0.6
Child	149	142	7	4.7
Adolescent	*113*	*112*	*1*	*0.9*
Adult	1432	1395	37	2.6
Total:	2346	2297	49	2.1

8.2.6. PERIMORTEM TRAUMA

Only skeletons with substantial representation of both cranial and postcranial remains were considered fully observable for the absence or presence of perimortem trauma. Of the 2,232 relatively complete individuals from the eight comparative cemeteries, 88 exhibit evidence of perimortem trauma or probable accidental cause of death (Table 8.7; see Table 7.17, p. 176 for Third Street data). No perimortem trauma was identified in the Second Catholic, Voegtly, or Avondale cemetery populations, which is not surprising since they provided three of the smallest observable samples. However, the high level of healed antemortem trauma reported for adolescents and adults buried in the Second Catholic Graveyard – 17 out of 44 observable – suggests hazardous living and working conditions which could be expected to result in occasional fatalities. The absence of evidence for perimortem injuries could be due to the excavation of only a very small portion of the burial ground (Harl *et al.* 1996:19).

Table 8.7. Number of individuals from the comparative sample observed with evidence of perimortem trauma, divided by age class. Cemeteries are arranged chronologically, oldest to most recent.

Age Class	# observable for perimortem trauma	# without perimortem trauma	# with perimortem trauma	% with perimortem trauma
Second Catholic Graveyard, St. Louis, Missouri, 1824-1850s (Harl *et al.* 1996)				
Infant	11	11	0	0.0
Child	5	5	0	0.0
Adolescent	*3*	*3*	*0*	*0.0*
Adult	38	38	0	0.0
Total:	57	57	0	0.0
Voegtly Cemetery, Pittsburgh, Pennsylvania, 1833-1861 (Ubelaker and Jones 2003)				
Infant	13	13	0	0.0
Child	12	12	0	0.0
Adolescent	*13*	*13*	*0*	*0.0*
Adult	108	108	0	0.0
Total:	146	146	0	0.0
Grafton Cemetery, Grafton, Illinois, 1834-1873 (Buikstra *et al.* 1996 and unpublished data)				
Infant	0	n/a	n/a	n/a
Child	2	1	1	50.0
Adolescent	*4*	*3*	*1*	*25.0*
Adult	41	40	1	2.4
Total:	47	44	3	6.4
Alameda-Stone Cemetery, Tucson, Arizona, 1860s-1875 (Heilen and Gray 2010b and unpublished data)				
Infant	353	353	0	0.0
Child	83	82	1	1.2
Adolescent	*36*	*32*	*4*	*11.1*
Adult	390	369	21	5.4
Total:	862	836	26	3.0
Freedman Cemetery, Dallas, Texas, 1869-1907 (Peter *et al.* 2000, Appendix E)				
Infant	79	79	0	0.0
Child	36	34	2	5.6
Adolescent	*41*	*40*	*1*	*2.4*
Adult	447	432	15	3.4
Total:	603	585	18	3.0
Avondale Burial Place, Bibb County, Georgia, 1869-1935 (Matternes *et al.* 2012b)				
Infant	0	n/a	n/a	n/a
Child	2	2	0	0.0
Adolescent	*2*	*2*	*0*	*0.0*
Adult	17	17	0	0.0
Total:	21	21	0	0.0

Table 8.7., continued.

Age Class	# observable for perimortem trauma	# without perimortem trauma	# with perimortem trauma	% with perimortem trauma
Dove Cemetery, Atascadero, California, 1870s-1890s (Sewell and Stanton 2008)				
Infant	2	2	0	0.0
Child	1	1	0	0.0
Adolescent	*1*	*1*	*0*	*0.0*
Adult	12	11	1	8.3
Total:	16	15	1	6.3
Milwaukee County Poor Farm Cemetery, Wauwatosa, Wisconsin, 1882-1925 (Richards *et al*. 2016 and unpublished data)				
Infant	177	172	5	2.8
Child	2	1	1	50.0
Adolescent	*10*	*9*	*1*	*10.0*
Adult	291	258	33	11.3
Total:	480	440	40	8.3
Totals (Pooled sample)				
Infant	635	630	5	0.8
Child	143	138	5	3.5
Adolescent	*110*	*103*	*7*	*6.4*
Adult	1344	1273	71	5.3
Total:	2232	2144	88	4.1

Infant Trauma

Infants with trauma were identified only in the sample from the MCPFC, the burial ground for many individuals who died in the Milwaukee County Hospital. A foetal individual (Burial 10726, 28-36 foetal weeks) with a perimortem fracture of the left parietal and a foetal-to-neonate (Burial 10202, 35 foetal weeks-2.6 post-natal months) with perimortem fractures of a first rib, humerus, femur, and both radii and fibulae may have died as a result of birth trauma and/or destructive obstetric procedures (Lewis 2007:169, 173-175). The 4- to 6-month-old in Burial 10007 exhibited an unhealed fracture on an unidentified cranial vault fragment; associated periosteal new bone formation suggests the infant initially survived a traumatic injury but eventually succumbed. Cut marks on the remaining two infants (Burials 10497 and 10717), both 4 to 8 months old, indicate anatomisation or autopsy, perhaps to investigate the right frontal fractures both children suffered. Burial 10497 also exhibited a healed fracture of the right femur.

General Perimortem Trauma

The majority of the perimortem trauma observed in the Grafton and MCPFC collections, and a third of that at Alameda-Stone, falls into the category of general fractures, usually affecting one region of the body and likely relating to accidental causes, though interpersonal violence cannot always be ruled out. This category includes almost half of the adolescents with trauma. A 15- to 17-year-old female (Burial 25451) from Alameda-Stone suffered a depression fracture to the right parietal around the time of death, while a 17- to 20-year-old (Burial 11599) male had a rectilinear fracture of the occipital. An 18- to 20-year-old male from the MCPFC (Burial 10521) exhibits perimortem fractures of both clavicles and both pubic rami (Figures 8.1-8.3). Also, a possible perimortem fracture crosses the retroauricular area of the left ilium. The ribs were extensively fragmented post-mortem, and only one possible perimortem fracture was identified. The facial bones are presumed to have been removed by excavation equipment (and not recovered), but no perimortem trauma was present on the cranial vault or any long bones. Bilateral clavicular fractures are relatively rare and are usually related to high-velocity automobile accidents or crush injuries with polytrauma (Marya *et al.* 2002). Bilateral straddle fractures of the pelvis (fractures of the superior and inferior pubic rami) are associated with genitourinary injuries and an overall higher level of mortality than pelvic fractures without such injuries (Bjurlin *et al*. 2009; Koraitim *et al.* 1996). Though the directional forces causing pelvic injuries can be difficult to determine in skeletonised human remains (Báez-Molgado *et al.* 2015), most clinical cases of pelvic fractures are related to vehicular trauma, falls, and crush injuries, and such fractures are commonly seen in motor vehicle fatalities (Coppola and Coppola 2000). The unusual and symmetrical nature of this young man's fractures suggests some type of high-energy impact injury, as might be seen in a train accident. Ground pressure fractures in the early post-burial period cannot be entirely ruled out, but seem unlikely, given that the young man was buried in a coffin.

Figure 8.1. Perimortem fracture of the left clavicle of an 18- to 20-year-old male from the MCPFC (Burial 10521). Photograph by author. Used with permission of the UWM Archaeological Research Laboratory and the Milwaukee County Poor Farm Cemetery Project.

Figure 8.2. Bilateral perimortem fractures of the pubic rami of an 18- to 20-year-old male from the MCPFC (Burial 10521). Possible perimortem fracture of left ilium. Photograph by author. Used with permission of the UWM Archaeological Research Laboratory and the Milwaukee County Poor Farm Cemetery Project.

Figure 8.3. Close-up of perimortem fracture of the left iliopubic ramus of an 18- to 20-year-old male from the MCPFC (Burial 10521). Note oblique fracture angle. Photograph by author. Used with permission of the UWM Archaeological Research Laboratory and the Milwaukee County Poor Farm Cemetery Project.

Two children also exhibited general perimortem trauma. A 10- to -12-year-old male (based on clothing, Burial 219) from Grafton Cemetery had an unhealed depression fracture of the frontal bone with fractures radiating from the point of impact. A 10-year-old from the MCPFC (Burial 10739) exhibited unhealed trauma to the parietals, with fracture lines crossing the sagittal suture. Adults accounted for most cases of general trauma (n=36). The most commonly affected single element was the femur (one case from Alameda-Stone, eight from MCPFC), followed by the cranium (three cases from Alameda-Stone, three from the MCPFC). Not surprisingly, rib fractures were also associated with individuals who died without healing, including four from the MCPFC. Unhealed fractures to the lower arm (n=3), lower leg (n=5), clavicle (n=1) and even metacarpal (n=1) were also reported, suggesting that the individuals died from concurrent soft-tissue injuries or unrelated causes. Seven individuals buried in the MCPFC exhibited severe trauma affecting multiple regions of the body, possibly related to railroad accidents, the most common external cause listed on available death certificates for this cemetery (Richards *et al*. 2016:31).

All of the adults listed with general perimortem trauma are male, except for four indeterminate individuals and three females. The 25- to 35-year-old female from Alameda-Stone with *lupus vulgaris* (Burial 19965) was also found to have a perimortem fracture to the right maxilla. At the MCPFC, one female (Burial 10782) had fractures of the left radius and ulna, while another (Burial 10785) displayed fractures of the left parietal and mandible. Age could not be estimated for these last two women. A modern clinical study (Novak 2006) demonstrated that when motor vehicle accidents are excluded, females with facial fractures are more often victims of domestic violence than accidents, particularly when the women are under 40. “Parry” fractures were not observed in this study, and forearm injuries, which are often regarded as evidence of interpersonal violence in bioarchaeology, were found to be identical to those seen clinically in accidental falls. However, the lack of severe defensive injuries reported in this study may be related to the fact that domestic assaults resulting in death were not included. Therefore, intimate partner violence cannot necessarily be excluded as the cause of perimortem forearm injuries in women. An additional injury, which was well-healed and therefore not considered during the current project, also suggests interpersonal violence; the older teenage girl in Burial 10091 experienced antemortem trauma to the maxilla resulting in the loss of the central and left lateral incisors.

Medical Intervention

Five individuals in the comparative samples died soon after attempted medical interventions, with no macroscopic signs of healing. Three of the individuals were children. At Alameda-Stone, a 3.5- to 4.0-year-old (Burial 26489) with periosteal new bone growth on the left ulna had most of the left radius and ulna removed close to the time of death. An adult male (Burial 6901) who also showed signs of infection underwent removal of his left tibia and fibula. At Freedman Cemetery, the only two children with perimortem trauma both underwent leg amputations. The individual identified as Lewis Clark, age 10 (Burial 147), had his feet and distal tibiae and fibulae removed, apparently in hopes of preventing the spread of septicaemia (Davidson 1999:379). An 11- to 12-year-old (Burial 1271) had the right leg removed at the distal femur but did not survive the procedure. An unhealed trepanation window is present on the right parietal of an adult male (Burial 10321) buried in the MCPFC.[2]

Evidence of Violence and Weapon Injuries

Indications of perimortem violence in the comparative sample include evidence of gunshot wounds (n=26), cuts/sharp force trauma (n=8), and one case of strangulation. Most of the affected individuals are adult males, but two gunshot victims are adolescents. Burial 33 in Grafton Cemetery held the remains of a 15- to 20-year-old female who had been shot twice. Preservation of the remains is very poor, preventing a precise determination of trauma, but one lead ball was recovered from the thorax and a second from the cranium. The bullet from the cranium (presumably) was deformed, but the other was intact enough for measurement (9.95 mm) and was consistent with a 0.41 calibre bullet. During the active period of this burial ground, the Deringer percussion pocket pistol was a popular firearm in this calibre (Flayderman 1983:347; Parsons 1952). The fact that the single-shot pistols were often sold in pairs paints a slightly less horrifying picture than that of an assailant standing over a wounded teenage girl, reloading black powder to deliver the fatal shot. A teenage boy

2 Though trepanation windows were observed on other anatomized crania in the MCPFC collection, this is the only example found in the sample of relatively complete skeletons.

from Freedman Cemetery, who was found with bird shot pellets in his facial bones, is believed to have died of a self-inflicted accidental shotgun wound. According to his death record, Oscar Eapham, age 14, survived for two weeks before he succumbed (Davidson 1999:381).

Evidence of gunshot trauma in the adults (n=24) ranges from possible to definitive. One male from Alameda-Stone and eight males and two females from Freedman Cemetery were found with bullets in the thoracic area. In all of these cases, the ribs were too poorly preserved to determine whether or not there was trauma. Trauma is evident in the other six cases from Alameda-Stone. A female has an exit wound posterior to the left mastoid (Burial 13131) and the male in Burial 8659 has a defect in his left scapula. Flattened bullets were found in the right ilium of Burial 21747 and the broken left sixth rib of Burial 2595. A bullet was embedded in the lumbar vertebrae of Burial 7199, and healing of another gunshot wound in the right ilium indicates that the man survived the initial attack, only to die later of complications. The entrance and exit wounds of the man in Burial 1278 are consistent with an intraoral gunshot, likely suicide. At Freedman Cemetery, males displayed unhealed gunshot wounds to the sacrum (Burial 30), frontal (Burial 36), and right humerus (Burial 1110). The individual in Burial 1188, believed to be Tucker Harris, suffered a self-inflicted gunshot to the chest, with the 0.45 calibre bullet still present at the time of excavation (Davidson 1999:380). In all three cases from the MCPFC (Burials 10651, 10781, and 10808), an obvious cranial gunshot wound is present, with the bullets recovered from two of the individuals.

Bullets were not the only deadly projectiles in use in nineteenth century America. Two adult males from Alameda-Stone (Burials 28544 and 3417-1) were documented with arrow wounds. In the first case, three stone arrow points were recovered with the individual, two with the cranium and one embedded in the right femur. The second individual suffered a perimortem puncture, consistent with an arrow wound, to the left scapula. A 14- to 16-year-old male (Burial 3417-2) buried in the same grave with this second adult had a stone arrow point in the right side of his torso, though poor preservation of the ribs prevented observation of trauma. The original report authors associated the Sobaipuri type projectile points with the Apache or Tohono O'odham tribes (Heilen and Gray 2010a:75), suggesting these three deaths were related to ongoing violence between settlers and displaced Native Americans.

Cut marks and sharp force trauma were noted on five additional adults. A male from Alameda-Stone (Burial 28504) exhibited a perimortem penetrating injury to the right parietal measuring 7.9 mm by 2.6 mm. Another male (Burial 23296) exhibited a large wound to the left parietal consistent with sharp force trauma from a bladed weapon such as a sabre. His death was apparently the last of a series of misfortunes, as he also had healed fractures to a left carpal phalanx, left rib, left scapula, and right ilium. Burial 21848 contained two stacked coffins holding a young adult female and a middle adult male, both of whom suffered multiple traumas around the time of death. The male had fractures to the right zygomatic and left zygomatic process, as well as both sides of the mandible, and most of the right maxillary tooth crowns were broken off. A cut mark was observed on the most inferior labial point of the mandible, in the region of the left first molar, suggesting the individual was assaulted with a small, bladed weapon like a knife. Fractures observed on the female include the greater horn of the hyoid, two right ribs, and two left ribs. A wedge-shaped cut mark was present on the inferior edge of a left rib, at the vertebral end. Grave shaft evidence points to concurrent burial for these individuals, which suggests that the couple were both beaten and stabbed to death in a single, brutal event. The young adult male in Burial 1072 from Freedman Cemetery appears to have survived one attack, only to be killed in a second. A healed bullet wound to the left femur (with the bullet still present) and a healed depression fracture of the left frontal were noted, along with perimortem cut marks on two ribs.

The last probable victim of interpersonal violence in the sample is the young adult female from Burial 21898 at Alameda-Stone. Perimortem fractures of both greater horns of the hyoid suggest death due to manual strangulation.

Evidence of Fire Fatalities

Two skeletons display evidence of exposure to fire. One, an adult male buried at Dove, was identified as Francisco Guerrero, a labourer who died in a barn fire, based on the pattern of thermal alteration to primary remains and the re-opening of the grave shaft for the interment of blackened and calcined elements of the hands and feet (Sewell and Stanton 2008). The second case, a 16- to 20-year-old male interred at Alameda-Stone (Burial 11853), is less certain due to the lack of detailed information concerning the burning pattern. However, the placement of incomplete, disarticulated elements, many of which were blackened or calcined, in an apparently small-sized coffin is consistent with treatment of remains recovered from a structure fire at another American cemetery (Kimmerle *et al.* 2016).

Age and Perimortem Trauma

Besides determining prevalence rates, the collection of data from the eight comparative cemeteries also identified patterns of trauma types. Infants rarely experienced life-threatening trauma after surviving the potential dangers of birth, but cranial injuries were likely to be deadly in individuals under the age of one year. Older children were also subject to cranial injuries and appear to have been less able than adults to survive amputation procedures. Even in modern clinical settings, traumatic limb amputations are more common in children than adults, though specialised paediatric care has greatly improved survival rates (Kahn *et al.* 2016). Adolescents in this sample suffered from a broader range of accidents than children, including two cranial traumas, accidental discharge of a weapon, a fire, and a high-energy impact injury, possibly a railroad accident. One adolescent was clearly the victim of interpersonal violence, with another case probable, based on the presence of a projectile point (1.8%, 2/110). Compare this with the adult sample, in which 36 individuals experienced a wide array of apparently accidental perimortem injuries (primarily affected the legs and head), three females may have been killed in assaults by domestic partners or strangers, and 32 individuals present obvious evidence of death from interpersonal violence (2.4%, 32/1,344). The results of Fisher's Exact Test found no significant difference (p=0.707) in the rates of violent death for adolescents and adults, a finding consistent with data from the burial records from the Campo Santo of San Fernando, discussed later in this chapter (Section 8.5). Interestingly, a study of violent death in nineteenth-century Philadelphia showed that teens who died from interpersonal violence did so at the hands of their adolescent peers (Lane 1979:71-72).

8.3. Early Childhood Pathology and Additional Disease Markers

Following the approach outlined in Chapter 7 (Section 7.6), combinations of early life stress markers and other evidence of pathology were used to investigate how episodes of childhood illness might have affected disease susceptibility later in life (acquired frailty). Only skeletons with at least three anterior teeth observable and substantial preservation of both the cranium and postcranial elements were included in this tally. These restrictions, in addition to the elimination of burial populations without dental inventories (Alameda-Stone and Freedman) and with suspect “periostitis” observations (Freedman and the MCPFC), brought the total number of observable individuals down to 230. Not one of the infants and children was found to exhibit both early-life and additional skeletal markers (0/29), while only one out of 23 adolescents (4.3%) and only five out of 178 adults (2.8%) had both, figures which were not found to be significantly different.

The impediments to including the three largest burial populations in these tallies could be overcome for a portion of the adolescents. Though re-analysis of the entire collection from the MCPFC was outside the scope of the current project, examination of all adolescent skeletons (n=13) was undertaken by the author in 2019. For the Alameda-Stone collection, published permanent tooth *counts* were available for half of the adolescents, and those with 23 teeth or more were considered to have been observable for LEH, as even with the maximum number of posterior teeth (20), at least three anterior teeth would also have been present. Unfortunately, the author could not control for post-mortem damage that would render the teeth present but unobservable for LEH. An even smaller sample of adolescents from the Freedman collection could be included, as hypoplasia recording ceased altogether at some point in the original analysis. Included in this sample are all teenagers for whom a hypoplasia form was filled out, though only portions of the form data were preserved. While some of these individuals did not exhibit any defects, there appears to be bias towards those with LEH in the sample. The table with all individuals evaluated for a combination of early-life and additional skeletal markers, including the original sample of 230 plus the additional 42 adolescents, can be found below (Table 8.8).

Table 8.8. Number of individuals from five comparative burial populations observable for evidence of early childhood health issues and additional pathological markers, divided by age class. Adolescent samples from three additional burial grounds are also included. Cemeteries are arranged chronologically, oldest to most recent.

Age Class	# with dental, cranial, postcranial remains	# with early markers	# with other pathological markers	# with both early and additional markers	% with both early and additional markers
Second Catholic Graveyard, St. Louis, Missouri, 1824-1850s (Harl *et al.* 1996 and unpublished data)					
Infant	0	n/a	n/a	n/a	n/a
Child	0	n/a	n/a	n/a	n/a
Adolescent	*3*	*2*	*0*	*0*	*0.0*
Adult	31	11	3	2	6.5
Total:	34	13	3	2	5.9
Voegtly Cemetery, Pittsburgh, Pennsylvania, 1833-1861 (Ubelaker and Jones 2003)					
Infant	11	1	0	0	0.0
Child	13	4	1	0	0.0
Adolescent	*13*	*5*	*1*	*1*	*7.7*
Adult	89	18	5	0	0.0
Total:	126	28	7	1	0.8
Grafton Cemetery, Grafton, Illinois, 1834-1873 (Buikstra *et al.* 1996 and unpublished data)					
Infant	0	n/a	n/a	n/a	n/a
Child	1	1	0	0	0.0
Adolescent	*4*	*3*	*0*	*0*	*0.0*
Adult	33	13	3	3	9.1
Total:	38	17	3	3	7.9
Alameda-Stone Cemetery, Tucson, Arizona, 1860s-1875 (Heilen and Gray 2010b and unpublished data)					
Adolescent	*16*	*4*	*2*	*1*	*6.3*
Freedman Cemetery, Dallas, Texas, 1869-1907 (Peter *et al.* 2000, Appendix E)					
Adolescent	*16*	*12*	*5*	*4*	*25.0*
Avondale Burial Place, Bibb County, Georgia, 1869-1935 (Matternes *et al.* 2012b)					
Infant	0	n/a	n/a	n/a	n/a
Child	1	1	0	0	0.0
Adolescent	*2*	*1*	*0*	*0*	*0.0*
Adult	14	3	0	0	0.0
Total:	17	5	0	0	0.0
Dove Cemetery, Atascadero, California, 1870s-1890s (Sewell and Stanton 2008)					
Infant	2	0	0	0	0.0
Child	1	0	0	0	0.0
Adolescent	*1*	*0*	*0*	*0*	*0.0*
Adult	11	2	0	0	0.0
Total:	15	2	0	0	0.0

Table 8.8., continued.

Age Class	# with dental, cranial, postcranial remains	# with early markers	# with other pathological markers	# with both early and additional markers	% with both early and additional markers
Milwaukee County Poor Farm Cemetery, Wauwatosa, Wisconsin, 1882-1925 (Richards *et al.* 2016 and unpublished data)					
Adolescent	*10*	*7*	*2*	*2*	*20.0*
Totals (Pooled sample)					
Infant	13	1	0	0	0.0
Child	16	6	1	0	0.0
Adolescent	*65*	*34*	*10*	*8*	*12.3*
Adult	178	47	11	5	2.8
Total:	272	88	22	13	4.8

When this sample of adolescents from the three additional collections is included, the overall percentage of teenagers with signs of both early childhood disease and later illness increases to 12.3% (8/65). Though the numbers are small, Fisher's Exact Test found statistical significance (p=0.007) in the difference between the prevalence rates among adolescents (non-survivors) and adults (survivors), just as in the Third Street sample (see Table 7.19, p. 180). Unfortunately, this outcome cannot be regarded as reliable, given the non-random nature of a sample inflated with "extra" adolescents and biased towards individuals with LEH. At best, the results are thought-provoking, perhaps offering a glimpse of how the energy investment demands of puberty might increase the immune vulnerability in individuals previously weakened by poor nutrition and disease (see McDade 2003). The possibility requires further investigation as additional nineteenth-century collections become available. A similar study of burial populations from other time periods and regions would have the potential to determine if this affect is seen with all disease loads, or if the signature is magnified in the presence of particular pathogens, such as *M. tuberculosis* (see Knick 1981).

8.4. Chronic Disease in the Adolescent Sample

Though only eight adolescents from the comparative sample exhibited skeletal lesions indicating both early life and additional health stresses, and though no pathognomonic skeletal lesions were observed, a closer look at these individuals (Table 8.9) highlights some interesting differences between the Third Street population and adolescents in other regions of the United States.

Table 8.9. Adolescent skeletons from the comparative sample exhibiting markers of early childhood health issues (LEH and CO/PH) and additional pathological markers, including labyrinthine endocranial lesions, nonfocal periosteal new bone formation, and possible tubercular or pulmonary lesions of the ribs.

Burial #	# of anterior teeth with LEH	CO/PH	Endocranial lesions	Periosteal new bone formation location	TB/ Respiratory lesions
Voegtly B.623	2	Absent	Absent	Femora	Absent
Alameda-Stone B.16835	0	CO	Absent	Mandible and humerus	Absent
Freedman B.90	2+	Absent	Absent	Femora	Absent
Freedman B.320	0	PH	Absent	Maxilla, mandible, tibia, fibula	Absent
Freedman B.333	2+	PH	Absent	Cranial remains, os coxae, metatarsals	Absent
Freedman B.1008	3+	Absent	Absent	Femur, tibia, fibula	Absent
MCPFC B.10516	6	Absent	Present	Absent	Absent
MCPFC B.10518	0	PH	Present	Absent	Absent

The only adolescent in this category from Voegtly Cemetery in Pennsylvania is the 13- to 14-year-old of indeterminate sex from Burial 623. Two enamel hypoplasias indicate a health insult prior to the age of six years, while active periosteal new bone formation on the medial surfaces of the middle two-thirds of both femora suggests systemic illness near the time of death (Ubelaker and Jones 2003:161). The four adolescents from Third Street who exhibited LEH and active periosteal bone formation of the femora demonstrated either additional markers of early illness

(CO/PH, n=2) or additional perimortem markers (endocranial lesions, n=2). The nonspecific manifestation of the Voegtly teen's probably fatal disease does not provide enough information for differential diagnosis, though periostitis of the limbs was known at the time to occur both in patients with typhoid fever and in those recovering from typhoid (Affleck 1885).

The adolescent from Alameda-Stone was 14 to 16 years old at the time of death. Sex is indeterminate, and ancestry was determined to be European. CO was observed in the left orbit (right damaged post-mortem), but no LEH were noted on the 29 observable tooth crowns. The left side of the mandible exhibited active periosteal bone apposition (right side damaged) and remodelling or remodelled new bone was present on the lateral surface of the proximal half of the right humeral shaft. The original analysis also recorded porosity described as lytic activity along the inferior medial border of both zygoma. This pattern of pathological bone was not observed in any of the Third Street teens. It is possible that the cause of the active bone apposition is unrelated to that of the lamellar bone on the humerus, as bilateral manifestation of the same element is more strongly indicative of systemic disease. It is also possible that this constellation of pathologies is related to a warm-climate disease like malaria (see Campo Santo Death Records, Section 8.5).

Freedman Cemetery was found to have the highest percentage of adolescents exhibiting both types of pathological markers, a finding which may or may not be significant. In addition to the sample bias, which likely favoured individuals with LEH, it is possible that the number of individuals with periosteal new bone formation is inflated with misidentifications. However, these mistakes are less likely with adolescent elements than with paediatric bone, which often presents with normal new bone growth. Though Freedman was the resting place for both the rich and poor of the African-American community of Dallas, the percentage of impoverished individuals may have been greater than in the average U.S. burial population, given the social barriers to economic improvement affecting African Americans at the time (Peter *et al.* 2000:57-146). A population with a higher percentage of individuals having inadequate access to good nutrition and health care could certainly be expected to exhibit a higher prevalence of chronic disease.

Nevertheless, the first teenager exhibiting both early-life and later skeletal markers of health insults definitely did *not* die of chronic disease. The 13- to14-year-old male in Burial 90, who presented with LEH of the canines and healed periosteal new bone formation on the femora, was identified as Oscar Eapham, who died as a result of an accidental, self-inflicted shotgun wound. The 14- to 15-year-old female in Burial 320 displayed PH (portion of cranium unknown) as well as healing periosteal new bone formation on one or both tibiae and fibulae, and healed periosteal bone apposition on the left maxilla and mandible. The distribution of periosteal lesions, particularly on the facial bones, is similar to that seen in scurvy but can also be attributed to pellagra, a nutritional deficiency disease common in the American South in the late nineteenth and early twentieth centuries (Paine and Brenton 2006). The monotonous diet of poor Blacks and Whites in the South consisted largely of cornmeal, molasses, and salt pork, a diet deficient in niacin and tryptophan due to the failure to adopt alkali processing which would make the nutrients in corn more bioavailable (Clay *et al.* 2019; Paine and Brenton 2006). The disease progress was characterised by the four D's – dermatitis, diarrhoea, dementia, and death. Most pellagrins did not die, as the reintroduction of niacin was sufficient to end symptoms, provided that concomitant anaemia and immune suppression had not already resulted in the contraction of infectious disease (Paine and Brenton 2006:127). The healing/healed lesions seen in this young woman are suggestive of an individual recovering from pellagra, but the lavish nature of her coffin decoration (including a viewing pane and coffin lid plaque) belies the kind of poverty that commonly caused the disease. However, a pre-existing illness could have led to the administration of a convalescent diet consisting primarily of cornmeal mush.

The Freedman teens in Burials 333 and 1008 both displayed LEH of the canines. The ca. 18-year-old female in Burial 333 also had PH and healed periosteal new bone formation affecting unspecified portions of the cranium. Healing periosteal bone apposition on both os coxae likely relates to a systemic disease, though the healed periosteal bone observed on the left third metatarsal could be due to a soft tissue injury. The 15- to 16-year-old male in Burial 1008 exhibited healing/healed periosteal new bone formation of one or both of the femora, tibiae, and fibulae. Either of these individuals could have suffered from pellagra, though many other diagnoses are possible as well. Unfortunately, observations of alveolar bone loss and caries – both associated with pellagra – are not available for this collection. Though both of these adolescents were found in decorated coffins, the wholesale hardware costs were low ($1.68 and $0.80, respectively) compared with the young woman in Burial 320 ($3.98), suggesting they could have been vulnerable to this disease of social inequality (Davidson 2004:197-612; Paine and Brenton 2006). However, typhoid fever is just as likely a diagnosis for the male, as only his leg or legs were affected. Osseous involvement in the pre-antibiotic era was noted primarily in young individuals whose bones were still growing, and, “It is often multiple and symmetrical, and may affect any bone, but has a predilection for the long bones, especially the tibia” (Vincent and Muratet 1917:75). Typhoid fever was documented as a public health issue in Dallas from its early days until the end of Freedman Cemetery’s active use period (Peter *et al.* 2000:98, 142).

The two adolescents with multiple skeletal markers from the MCPFC were interred close to one another, in Burials 10516 and 10518. Both individuals are males, age 17 to 18 and age 18 to 20 years, respectively. Twelve LEH are visible on six anterior teeth of the younger man, and he exhibits sclerotic periosteal new bone formation on the proximal right fibula shaft. Thin white bone deposits are present on the endocranial surface of the frontal, parietals, temporal squama, and occipital. Apposition is thickest in the sagittal sulcus, where capillary impressions were beginning to form (Figure 8.4). Labyrinthine impressions are also visible on the right temporal squama (Figure 8.5). Lewis (2004) cautions against the classification of white fibre bone deposits as pathological in young children, as the observed apposition may be part of normal cranial growth. However, in a near-adult, even this mild expression of the lesion can be considered abnormal. Given the widespread nature of the lesions, chronic meningitis (tuberculous or otherwise) seems a more likely cause than haematoma. The young man’s cause of death was apparently considered brain-related and worthy of investigation, as a craniotomy was performed. No other bones were cut, indicating an abbreviated autopsy rather than dissection for general anatomical study.

Figure 8.4. White fibre bone deposits in the sagittal sulcus of the adolescent male in Burial 10516, MCPFC. Photograph by author. Used with permission of the UWM Archaeological Research Laboratory and the Milwaukee County Poor Farm Cemetery Project.

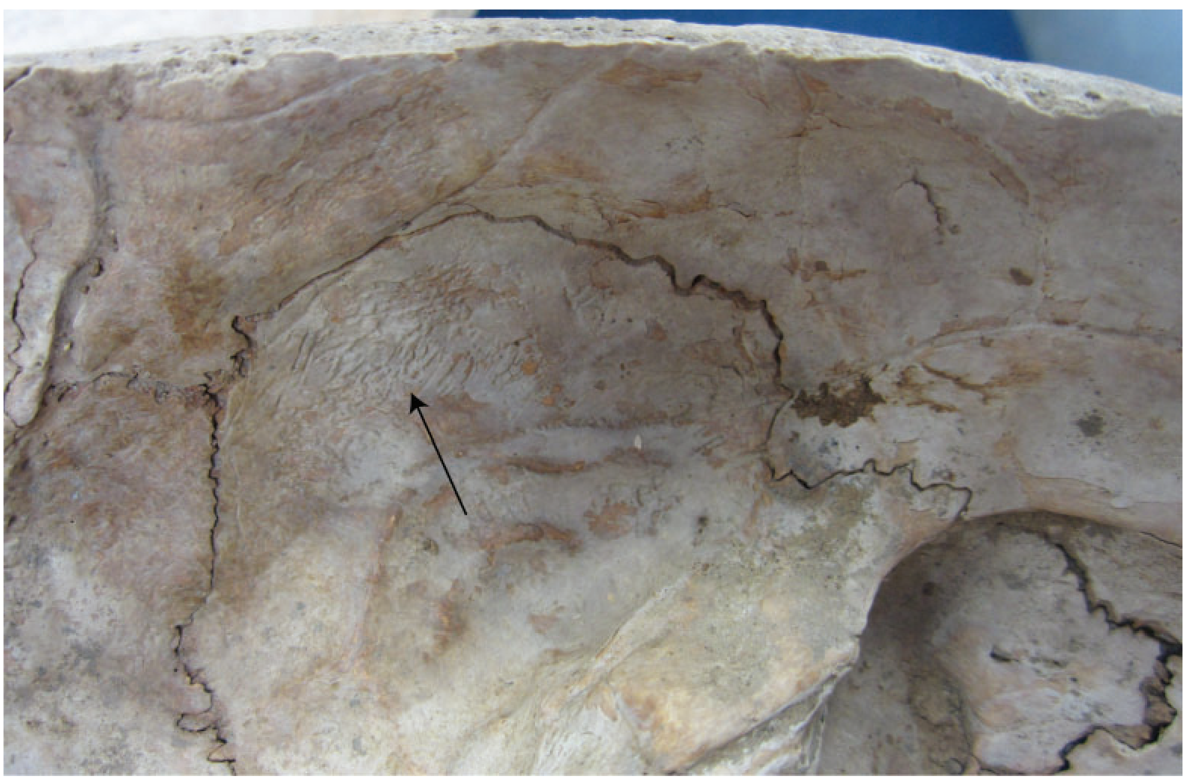

Figure 8.5. Labyrinthine endocranial lesions on the right temporal squama of the adolescent male in Burial 10516, MCPFC. Photograph by author. Used with permission of the UWM Archaeological Research Laboratory and the Milwaukee County Poor Farm Cemetery Project.

The older adolescent from the MCPFC, in Burial 10518, displays very well-healed PH on the posterior parietals and superior occipital. A small patch of sclerotic periosteal new bone formation is present on the medial surface of the distal left tibial shaft. Like the individual above, this young man has very thin deposits of grey-coloured new bone on the endocranial surface of the frontal. Slightly thicker, plate-like deposits are present in the transverse sulcus of the occipital. The parietals are unaffected. Though many diagnoses are possible, the presence of new bone at the front and back of the cranium could be consistent with haemorrhage following a whiplash-type injury, rather than the result of inflammation (Hershkowitz *et al.* 2002:209; Lewis 2004:95).

Absent from this group of adolescents is any clear evidence of TB or chronic pulmonary disease, which was seen in three teenagers with early-life stress markers from Third Street (Table 7.20, p. 183). The only teen in the comparative sample with possible evidence of TB, the 14- to 16-year-old of indeterminate sex from Alameda-Stone (Burial 16586), displayed no evidence of earlier serious health insults. This dearth of evidence could be due to the rarity of skeletal manifestations of TB, along with the small sample of fully observable adolescents. The absence could also relate to the prevalence of TB in different regions of the U.S. The Dubuque City Cemetery records provided evidence of the high toll taken by TB in Midwestern populations. Below, the burial records of Campo Santo in San Antonio, Texas, illustrate a different disease load in the American Southwest.

8.5. Burial Records of Campo Santo de San Fernando

The tenth burial ground selected to provide comparative data, the Campo Santo of San Fernando Cathedral in San Antonio, Texas, was used for interments from 1808 to 1860. After the cemetery closed, some of the burials were moved, and a hospital was built over the site. In 2015, landscaping on hospital grounds disturbed several graves. In preparation for excavation of a portion of the cemetery, a team from the Center for Archaeological Research (CAR) and the Department of History at the University of Texas-San Antonio (UTSA) began research on the site, digitising almost 3,000 entries from parish death records (Mauldin *et al.* 2018). However, outcry from potential descendant groups halted the excavation in 2018 (Cynthia Munoz, personal communication 2019). Though project cancellation prevented the inclusion of skeletal data from the site in the current study, the parish records proved a valuable source of information about health and mortality in the Southwest in the early nineteenth century.

Like most records created prior to legally mandated municipal death reporting, the individual entries from the San Fernando burial books provide varying levels of detail concerning the deceased. Out of the 2,925 entries, only 2,723 provide information about the general age of the deceased (Figure 8.6), and only 1,265 give both age and cause of death (Leal 1975). The ratio of infants to children seen in the records is unusual, as all of the other comparative cemeteries held a much higher proportion of infant graves. However, this apparent paucity of infants is likely due to the use of the word “child” (“*niño*”) for individuals ranging from newborns to adolescents. Some of the original entries specify age (e.g., “child 8 days old”), but those that do not were entered into the CAR-UTSA database in the “child” age class (Mauldin *et al.* 2018). If the numbers of the reported infants and children are added together, the age group makes up almost 45% (1,204/2,723) of the burial population, which is consistent with the proportions observed in most of the cemeteries in this study. This combined category accounted for 53.2% (470/883) of the Third Street Cemetery population.

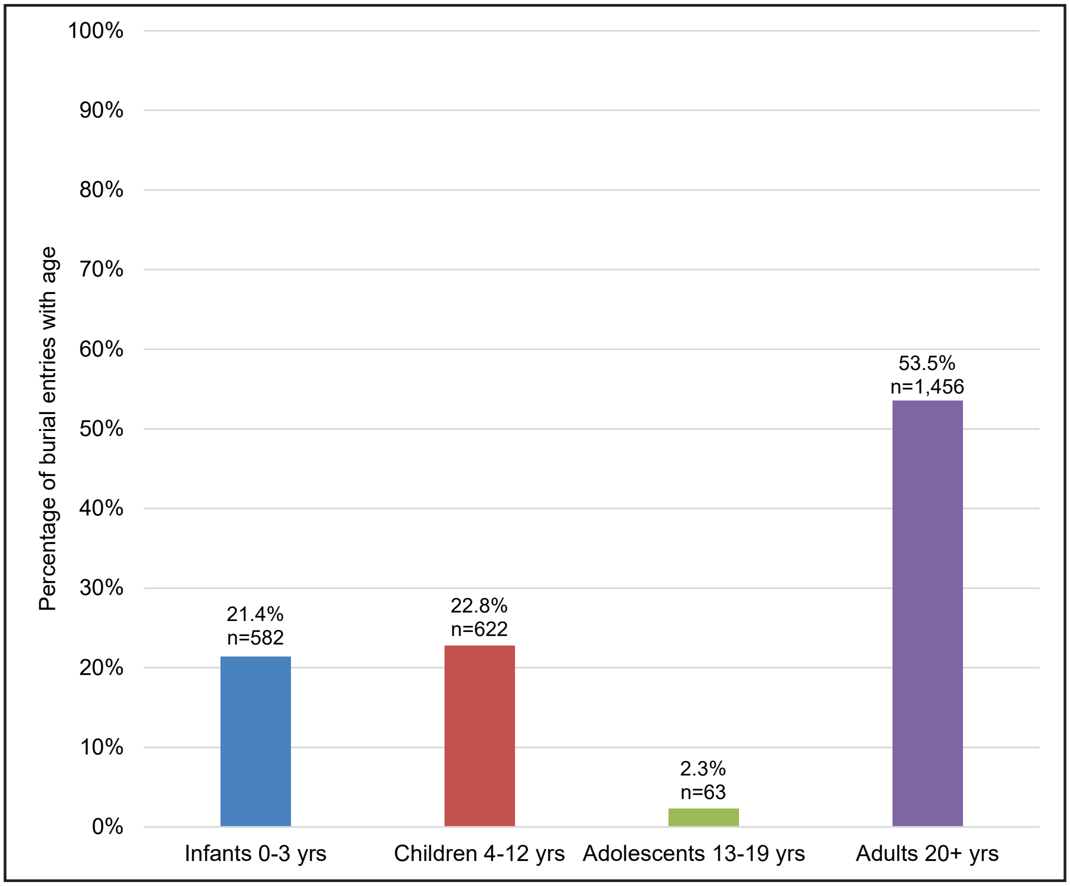

Figure 8.6. Bar graph showing the age class distribution of 2,723 individuals listed in the San Fernando burial records.

Another issue with the Campo Santo records is the inconsistent reporting of cause of death. Three variables appear to affect the likelihood that cause is given. The most obvious variable is the year of death. From 1808 to 1839, cause of death was frequently recorded. After 1839, the number of deaths with cause reported drops drastically, and by 1849, such details were very rarely given. Though more deaths were recorded in 1849 than any other year (n=202), cause of death is given for just two individuals. Out of the 736 deaths recorded in the 1850s, only 19 entries provide cause. These 19 entries are evidence of another bias in the burial records, that of sensationalism. Sixteen of the 19 deaths with reported cause were due to violence or violent accidents, with notes such as “shot by Indians,” “killed by thieves,” “killed in an affair,” and “hung.” The seemingly high proportion of individuals at Campo Santo who died from external causes may be due to this recording bias (also seen in the St. Raphael’s Burial Register), even in the earliest period when cause of death was more commonly included.

Age is the third variable affecting the reporting of cause of death. Figure 8.7 shows the age class proportions of individuals with cause recorded. When these proportions are compared with those shown in Figure 8.6, it is clear that cause was much less likely to be provided when infants died. Only 11% (64/582) of the infant entries give cause of death. The highest proportion seen is that of adolescents, 80% of whom (50/62) have cause of death recorded. Of course, the high percentage may be due to the fact that entries *identified* as adolescents tend to provide more information in general. Entries for adolescents lacking details such as precise age were unidentifiable as such, and thus were likely recorded in the CAR-UTSA database as children.

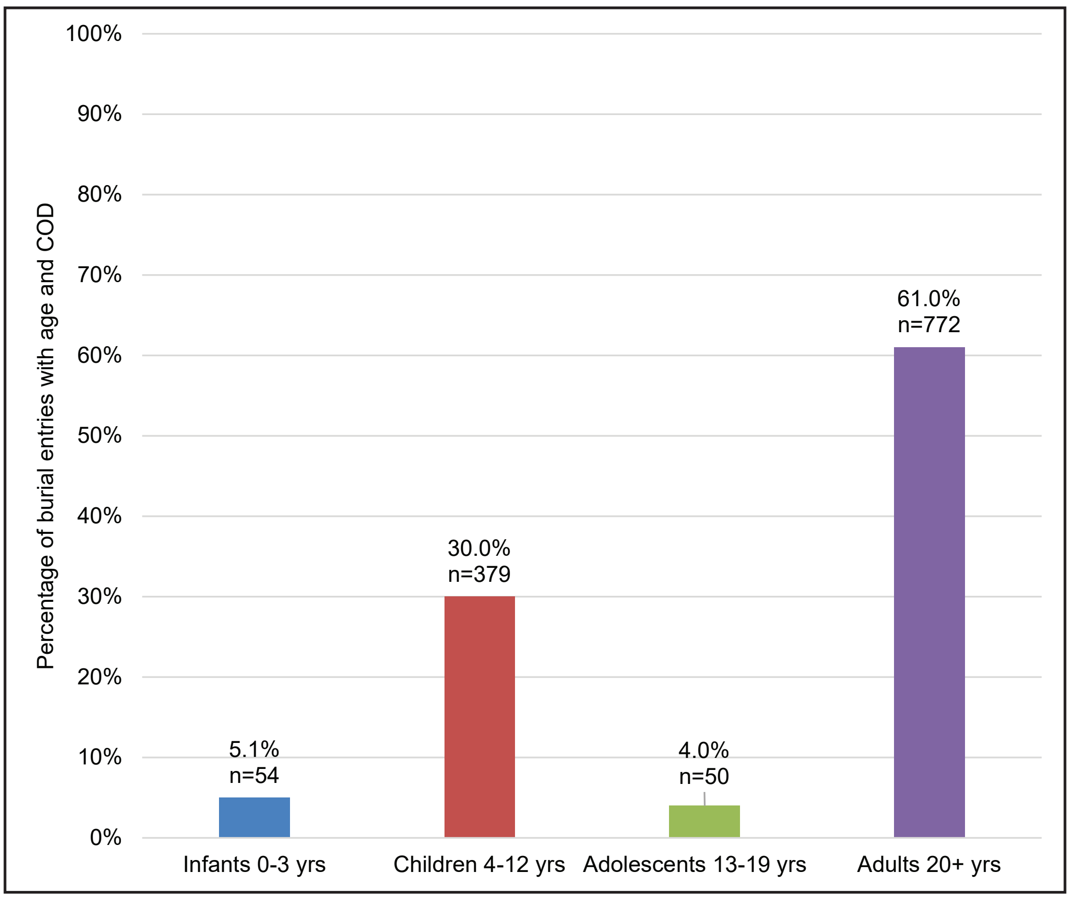

Figure 8.7. Bar graph showing the age class distribution of 1,265 individuals listed in the San Fernando burial records with both age and cause of death given.

8.5.1. CAUSE OF DEATH AT CAMPO SANTO

Medical Causes

Most Campo Santo entries that provide a medical cause of death are vague. Of the 1,265 detailed entries, 300 give nonspecific “fever” as the cause of death. Yellow fever and dengue fever epidemics were common in Texas in the nineteenth century, but major outbreaks are not recorded for this time period in San Antonio (Burns 2010; Corner 1890). The original researchers believe the “fever” entries likely refer to a number of different conditions (Cynthia Munoz, personal communication 2019). The next most common causes are “pain” (n=152), followed by “cough” (n=51), dysentery (n=51), and “natural death” or “old age” (n=44). Forty individuals are listed with smallpox, but all these deaths occurred during a single epidemic between October 1815 and January 1816.

Only 34 deaths from tuberculosis are recorded, though an additional 20 people died from “*tiricia*” (listlessness/fatigue) and 21 died “long illness” or “habitual sickness.” Almost all of these individuals are adults. Considering only the explicitly referenced TB cases, 25 adult females, 8 adult males, and one child were affected. In the Campo Santo records, TB accounts for only 4.3% (33/772) of adult deaths with cause given; no adolescent cases are reported. Compare these frequencies with those of the Dubuque City Cemetery records, in which TB accounts for 21.8% (225/1,031) of adult deaths and 28.5% (35/123) adolescent deaths.

Twenty-seven women died in childbirth and 20 people died from indigestion. The remainder of medical causes are found in fewer than 20 entries. Only one case of cholera is reported in the parish records, though San Antonio suffered a cholera epidemic in 1849 that left over 500 people dead (Burns 2010; Corner 1890:139,146). While none of the 1849 entries mentions cholera, the unusually high number of deaths – 202, when the average for 1808 to 1860 is 55 per year – suggests the parish was severely affected by the epidemic. This heavy toll stands in sharp contrast with the situation in Dubuque, where rumours of cholera far outnumbered actual deaths (Lillie and Mack 2015:46-47).

Mortality patterns at Campo Santo were expected to diverge from those documented in Dubuque given that varying climates are hospitable to different types of disease. The short, mild winters, hot summers, and warm waters of Texas provided favourable breeding grounds for *Vibrio cholerae* and for mosquitos carrying malaria parasites and the viruses that cause yellow and dengue fevers. Meanwhile the dense populations of rapidly growing cities like Dubuque encouraged the spread of TB (Roberts and Buikstra 2003:5). Cultural practices such as diet, age at weaning, and sanitation may have also played a role in mortality rates as well. Though both Dubuque and San Antonio were majority Catholic communities, their populations were culturally distinct, with Dubuque founded largely by Irish and German immigrants and San Antonio developing from an outpost that was primarily Spanish, Mexican, and Native American in the eighteenth century (Corner 1890:68-77; Teja 1995). In fact, the community was not technically part of the United States for most of the active period of the cemetery. Until 1810, San Antonio was firmly under Spanish rule. The town was contested ground during the Mexican War of Independence (1810 to 1821), but from 1821 to 1836, the area flourished as part of the Mexican Empire, attracting many American colonists. From 1835 to 1836, the town, with its military garrisons, was at the centre of the Texas Revolution, which ended soon after the nearby battle of the Alamo. The Republic of Texas did not last long, with the Mexican army invading San Antonio again in 1842. The U.S. formally annexed Texas in 1845 (Corner 1890:77-89).

External Causes

The violent backdrop of this community is reflected in the high number of deaths from external causes, which account for almost 20% of the entries with age and cause given (244/1,265). Surprisingly, only 25 deaths are reported as battle-related, while 175 were related to non-military violence (or at least not specified), 42 were accidental, and two were executions. Of the violent deaths, 130 (plus three additional individuals with no age given) fall into the category “killed by Indians.” From 1811 to 1847, nearly every year of the parish records includes at least one death of this type, with an additional killing in 1852. The large number is not due to a few major incidents. Two years, 1813 and 1815, each saw 13 deaths due to Native American interaction, but the remainder of the records show between one and nine cases per year. The demographic composition of the buried victims – 122 adult males, 3 adult females, 1 adolescent male, 1 male child, and 3 unsexed children – is suggestive of skirmishes outside of town rather than raids on the community. Reporting bias in favour of noteworthy cause of death is suggested by the high percentage of adult deaths (16.2%, 125/772) due to Native American conflict, though the amount of bloodshed could be accurate, given ample documentation of the tumultuous situation in nineteenth-century Texas.

8.5.2. ADOLESCENT CAUSE OF DEATH AT CAMPO SANTO

Of the 50 adolescents listed with cause of death in the Campo Santo records, 38 died from medical causes, eight were murdered, and four died in accidents (Table 8.10). Unfortunately, given the vague terms used to describe medical conditions, such as “fever” and “pain,” little can be said about the illnesses that affected this youthful part of the population. The absence of TB is worth noting, though individuals listed with *tiricia* (n=2) or even cough (n=3) might have been consumptives. Also of interest are the two adolescent girls, aged 16 and 17, who died in childbirth. The young age of these girls, both married, combined with the fact that some of the murdered boys were 14, 15, and 16, suggests that adolescence may have ended earlier in the Southwest. This abbreviated adolescence is addressed further in Chapter 10.

As mentioned above, the high number of deaths from external causes could be due to reporting bias. However, a rate of 24% (12/50) is not significantly higher than that observed for adolescents in the Dubuque City Cemetery records (19.5%, 24/123), in which cause of death is listed for nearly all individuals. Females have greater representation among the deaths from external causes in the Campo Santo (25%, 3/12), including a 13-year-old who died of “wounds,” a 15-year-old “killed by a pistol shot,” and a 17-year-old who died in an unspecified accident. Out of the 24 adolescents listed in the Dubuque City Cemetery records with external causes, only one was female (4.2%).

Table 8.10. Disease-related and external causes of death listed for adolescents in the Campo Santo de San Fernando burial records, 1808-1860.

Disease	# of adolescent deaths	% of adolescent deaths
Fever	16	32.0
Pain	5	10.0
Measles	3	6.0
Cough	3	6.0
Smallpox	3	6.0
Tiricia (fatigue)	2	4.0
Childbirth	2	4.0
Dysentery	1	2.0
Spasms	1	2.0
Gastric pains	1	2.0
Cold	1	2.0
External causes:		
Homicide, shooting	5	10.0
Homicide, unspecified	3	6.0
Accident, horse or wagon	3	6.0
Accident, unspecified	1	2.0
Total adolescent deaths:	50	100.0

Table 8.11 presents a breakdown of external causes of death identified in the Campo Santo records. Children were clearly less frequently affected, but the overall prevalence rates (last column) for adolescents and adults are not significantly different. The contrast lies in the types of deaths each age group most often experienced. Children drowned at three times the rate of adults, and adolescents are missing from this category, an unexpected finding, based on the frequency of teen drownings seen in Dubuque. Adolescents had the highest rates of death from accidents and homicide of an interpersonal nature (i.e., unrelated to larger conflicts). Adults, on the other hand, while victims of accidents and homicide, more often died in conflicts, including formal battles, hostilities with Native Americans, and judicial execution. These figures suggest that while adulthood may have come sooner in the Southwest, young men were, to some extent, kept away from the front lines of combat.

Table 8.11. Number of individuals in Campo Santo records (1808-1860) listed with various types of external cause of death, divided by age class. Prevalence per 1,000 also given for each age class. The single infant who died of accidental sunstroke is not included.

Age Class	Accident-drowning	Other accidents	Homicide	"Killed by Indians"	Battle/execution	All external causes
(# of individuals)	**#/prevalence per 1,000**	**#/prevalence per 1,000**	**#/prevalence per 1,000**	**#/prevalence per 1,000**	**#/prevalence per 1,000**	**#/prevalence per 1,000**
Child, 4-12 yr (n=379)	11/29	5/13	0	4/11	0	20/53
Adolescent, 13-19 yr (n=50)	0	4/80	7/140	1/20	0	12/240
Adult, 20+ yr (n=772)	8/10	13/17	38/49	125/162	27/35	211/273

Though the Campo Santo records are incomplete and provide the most detailed information for years predating both the Third Street Cemetery and U.S. annexation of Texas, data gathered from the entries are relevant to several of the comparative cemeteries. The humid, subtropical climate of San Antonio and its accompanying diseases are shared with the locations of the Second Catholic Graveyard, Grafton Cemetery, Freedman Cemetery, and the Avondale Burial Place. The political upheaval of the separation from Mexico was experienced not only in the rest of Texas, but in Tucson, Arizona (Alameda-Stone Cemetery), which did not become U.S. territory until the Gadsen Purchase in 1854 (Heilen and Gray 2010a:11). Additionally, many of the families that utilised the Alameda-Stone and Dove Cemeteries shared the same Mexican and Native American backgrounds as the population of nineteenth-century San Antonio. These commonalities may partially explain the paucity of evidence for TB among teens in Alameda-Stone, Freedman, and Avondale, as warm-climate fevers may have outpaced TB infections. Adult rates of violent death observed at Alameda-Stone (3.5%, 14/390) and Freedman (3.4%, 15/447) significantly exceed those seen at Third Street (1.0%, 3/300) and the MCPFC (0.9%, 3/322), demonstrating the effects of instability and upheaval in these southern cities.

8.6. Midwestern Model for Adolescent Pathology

Osteological observations for the adolescent population from each cemetery were entered into the Midwestern Model for skeletal evidence of chronic disease and trauma, described in Chapter 7 and based on the Dubuque City Cemetery records (Table 8.12). The observable prevalence (and # expected) of TB/pulmonary disease is based on a potential 90% of affected individuals demonstrating bone lesions of the ribs (Matos and Santos 2006), while the number in parentheses corresponds to a more conservative 12% rate of skeletal involvement in sub-adults (Bernard 2003). For other chronic diseases, as well as trauma, the prevalence is based simply on the number of affected individuals in the City Cemetery records.

Table 8.12. Midwestern model for skeletally observable evidence of chronic disease and trauma among adolescents, applied to comparative samples from eight U.S. cemeteries. Prevalence figures based on Dubuque City Cemetery records.

Cause of Death	**Observable prevalence per 1,000, City Cem.**	**Second Catholic Graveyard**			**Voegtly Cemetery**			**Grafton Cemetery**		
		# of adol. observable	**# Expected**	**# Observed**	**# of adol. observable**	**# Expected**	**# Observed**	**# of adol. observable**	**# Expected**	**# Observed**
TB/pulmonary disease	307 (41)	3	1 (0)	0	13	4 (0)	0	4	1-2 (0)	0
Other chronic disease	203	3	1	0	17	3-4	2	6	1-2	0
Trauma	41	3	0	0	13	0	0	4	0	1

Cause of Death	**Observable prevalence per 1,000, City Cem.**	**Alameda-Stone Cemetery**			**Freedman Cemetery**			**Avondale Burial Place**		
		# of adol. observable	**# Expected**	**# Observed**	**# of adol. observable**	**# Expected**	**# Observed**	**# of adol. observable**	**# Expected**	**# Observed**
TB/pulmonary disease	307 (41)	37	11-12 (1-2)	1	41	12-13 (1-2)	0	2	1 (0)	0
Other chronic disease	203	37	7-8	2	45	9-10	17	2	0	0
Trauma	41	36	1-2	4	41	1-2	1	2	0	0

Table 8.12., continued.

Cause of Death	Observable prevalence per 1,000, City Cem.	Dove Cemetery			Milwaukee County Poor Farm Cemetery			Pooled sample		
		# of adol. observable	# Expected	# Observed	# of adol. observable	# Expected	# Observed	# of adol. observable	# Expected	# Observed
TB/pulmonary disease	307 (41)	1	0 (0)	0	12	3-4 (0)	0	113	34-35 (4-5)	1
Other chronic disease	203	1	0	0	12	2-3	2	123	24-25	23
Trauma	41	1	0	0	10	0	1	110	4-5	7

Table 8.13. Midwestern model for skeletally observable evidence of chronic disease and trauma among adolescents, including pooled data from eight comparative cemetery samples and from the Third Street Cemetery. Prevalence figures based on Dubuque City Cemetery records.

Cause of Death	Observable prevalence per 1,000, City Cem.	Pooled sample			Third Street Cemetery			Pooled sample w/ Third Street		
		# of adol. observable	# Expected	# Observed	# of adol. observable	# Expected	# Observed	# of adol. observable	# Expected	# Observed
TB/pulmonary disease	307 (41)	113	34-35 (4-5)	1	40	12-13 (1-2)	3	153	46-47 (6-7)	4
Other chronic disease	203	123	24-25	23	42	8-9	7	165	33-34	30
Trauma	41	110	4-5	7	40	1-2	0	150	6-7	7

Adolescent samples from the Second Catholic Graveyard, Avondale Burial Place, and Grafton and Dove Cemeteries are so small that little to no pathology or trauma was expected. The remaining four burial grounds produced at least a portion of the expected skeletal observations. In only one instance was the observed pathology significantly greater than the expected; general chronic disease was seen far more frequently than expected in the Freedman Cemetery teens (χ^2=6.300, df=1, p=0.012), which points either to a high urban disease load or misidentification of periosteal new bone formation. Most of the samples are too small for chi-square goodness of fit tests, as expected numbers are <5. When the test was applied to the pooled sample, all values were found to be consistent with the predicted figures; even the single case of TB does not represent a significant deviation from the smaller expected number of five cases (χ^2=3.348, df=1, p=0.067). When the numbers from Third Street are added to the pooled sample, even greater congruence with the expected figures is reached (Table 8.13). Given the diversity of settlement types (urban, rural, and pioneer), climates (continental, subtropical, semi-arid, Mediterranean), and cultural groups (American-born, Irish, German, French, African American, Mexican, Native American) represented in the pooled sample, and the likelihood of fluctuations in proportional disease rates over time (Wood *et al.* 1992:352), the apparent good fit of the model is of uncertain relevance. While the results are intriguing, further investigation is necessary using larger samples and more consistent osteological methods.

8.7. Discussion and Summary

Age distributions of the six selected skeletal markers in samples from the eight comparative cemetery populations provided some insights regarding temporal and regional trends in the United States. Though systematic LEH observations were available for only a portion of the sample, a temporal pattern is suggested by the age distribution seen in different cemeteries. Earlier populations tend to exhibit equal frequencies of LEH between older children and adolescent non-survivors and adults (survivors), while in later samples, non-surviving adolescents have a higher prevalence. The opposite trend is seen with CO/PH, which is more prevalent in children and adolescents in the first half of the century, but equally present in adults (healed lesions) in the second half of the century. Together, these distributions suggest improvements in overall health and survival of young children as the century progressed. LEH do not form unless a child survives a health insult, while CO and PH can appear during an illness. In the first half of the century more children apparently died from diseases that caused active CO/PH. Children who managed to survive health and nutritional insults and become adolescents with LEH were then perhaps equally likely to die as youths or to make it to adulthood. In the later part of the century, more children were able to survive serious disease, resulting in a broader age distribution of healed CO/PH lesions. The fact that LEH were more prevalent among adolescent non-survivors in this period lends support to the hypothesis that individuals who persist through grave illness in infancy and early childhood are more vulnerable to disease in adolescence.

The overall dearth of evidence for TB, particularly among adolescents, was surprising. The most obvious explanation is the clinically reported rarity of skeletal manifestations. Though Matos and Santos (2006) found bone lesions on the pleural rib surfaces of 90% of anatomical collection skeletons documented as TB patients, this frequency of skeletal involvement has not been observed in archaeologically recovered materials, perhaps partially due to rib preservation issues. However, the bone quality of the adolescents from the MCPFC is good, and the population is known to have suffered from a high rate of TB (Richards *et al*. 2016:31). In this case, small adolescent sample size may be a factor. The absence of evidence among teenagers in the Freedman collection, which has the largest adolescent population and many adult examples of TB/pulmonary disease evidence, is even more perplexing given the high rate of TB infections in the Dallas population at large (Peter *et al.* 2000:142). Available funeral records (1902-1907) from an undertaker who serviced the African-American community in Dallas include 15 entries of adolescents with cause of death listed. Of these, 10 died of TB, including six girls, three boys, and one unidentified teen (Davidson 2004:799-820). Clearly, TB was a problem in puberty by the end of the cemetery's active use period. Multiple medical studies have demonstrated greater susceptibility to TB in individuals of African ancestry, likely due to the shorter period during which African populations have been exposed to the disease, when compared with Europeans. Lesser immune resistance to TB in the African-American community may have led to more rapid deaths, particularly among the young and vulnerable, which left no sign of chronic disease on the skeleton (Roberts and Buikstra 2003:19-20, 50-51).

Accidents and violence were deadly issues for adults and adolescents alike. The Dallas undertaker's records mentioned above also list a young man who was shot and a 17-year-old girl who was stabbed in the heart. The comparative cemetery sample includes a teenage girl from Grafton who was killed with two gunshots and a teenage boy from Alameda-Stone who was shot with an arrow. Though the numbers are low, there is no statistical difference between the rates of general perimortem trauma or interpersonal violence for adolescents and adults.

Though the pooled comparative cemetery sample for observations of early-life stress combined with additional or later disease markers includes non-random samples from three of the burial grounds, the results are at least suggestive of adolescent immune vulnerability due to previous health insults. In the Third Street Cemetery population, this acquired frailty is hypothesised to be related, in part, to re-activation of primary TB in puberty, when changes in immune system strategy create an environment favourable to the development of adult-type TB infections (Marais 2005:83-84). The paucity of evidence for TB in adolescents in the comparative cemeteries could be related to a lack of skeletal involvement or to manifestation in the form of non-pathognamonic lesions. However, the absence could also be due to proportional mortality issues. In some nineteenth century populations, TB may not have killed as high a percentage of teenagers if they were vulnerable to other, more acute fatal diseases thanks to reduced immunity during pubertal development, particularly in high-pathogen environments (McDade 2003:118). Evidence suggestive of highly contagious, fatal infections was noted in Grafton Cemetery, where six charred coffins were interpreted as an attempt to prevent the spread of a quick-killing disease such as cholera (Buikstra *et al.* 2000:118-120). Interestingly, 50% (3/6) of the coffins held the remains of teenagers, though adolescents comprise only 7.3% (18/246) of the cemetery population. Environmental factors likely determined what diseases competed with TB for adolescent mortality, with warm southern states experiencing much higher rates of mosquito-borne illnesses as well as cholera (Burns 2010; Duffy 1968; Supervising Surgeon-General 1899). Pellagra, a disease of nutritional deficiency, did not exist in the United States outside of the South.

Regional differences in disease loads are highlighted in the funeral records from the Campo Santo de San Fernando, which give "fever" and "pain" as the most common causes of death. Though fever is also a symptom of pulmonary TB, the fact that several entries list TB as a cause of death indicates that recorders noted the distinction. Yellow fever, dengue fever, and malaria, all of which were prevalent in nineteenth-century Texas (Burns 2010), are likely candidates. Dengue fever, which is associated with excruciating limb pain (Supervising Surgeon-General 1899:293), may be responsible for some of the deaths from "pain." It should be noted that these tropical fevers (other than malaria) do not affect the skeletal system and therefore would be undetectable in cemetery samples, except possibly through analysis of preserved soft tissue (Kimberlee Moran, personal communication 2020).

Another distinguishing feature of the Campo Santo records is the high rate of interpersonal violence reported, much of which was related to hostilities between the Native American and colonist populations, an issue that did not affect communities in northern and southeastern states. Over 24% (198/822) of adolescents and adults buried at Campo Santo died violently, compared with the 0.8% (9/1,154) seen in the Dubuque City Cemetery records. Though the high proportion of deaths due to violence may be exaggerated by reporting bias, the overall numbers speak to unstable conditions on the frontier. This Southwest frontier instability is evident in the higher rate of violence-related perimortem trauma in the Alameda-Stone sample. The relatively high rate of violence in the Freedman Cemetery sample may be related to social conflict between Euroamericans and African Americans during the Reconstruction and Jim Crow eras (Peter *et al.* 2000).

The Midwestern Model for skeletal evidence of chronic disease and trauma in adolescents is of questionable applicability to populations from such diverse environmental and social settings. However, given the shortcomings of the Campo Santo records – particularly the failure to identify specific diseases – a separate southern model could not be developed for the current project. The overall congruence of the numbers from the pooled sample and the numbers expected based on the Midwestern model is suggestive of adolescent mortality patterns that, like evidence of the effects of acquired frailty on adolescent disease susceptibility, require further investigation with larger sample sizes.

Chapter 9

Mortuary Treatment Patterns at the Third Street Cemetery

9.1. The Third Street Cemetery Sample

9.1.1. AGE DISTRIBUTION

Of the 939 burials archaeologically excavated at the Third Street Cemetery, only 883 held individuals that could be assigned to a general age class based on skeletal remains or, in the case of small infants, coffin size. Of these age-classified individuals, only 805 were recovered from burial features that were sufficiently intact (Code 1 or 2) to permit interpretations of coffin decoration, burial attire, and grave goods. These 805 undisturbed or partially disturbed features include the burials of 371 infants 0 to 3 years old (46.1%), 68 children 3 to 12 years old (8.4%), 41 adolescents 12 to 20 years old (5.1%), and 325 adults 20 years or older (40.4%) (Figure 9.1). See Appendix A for complete descriptions of adolescent burial features.

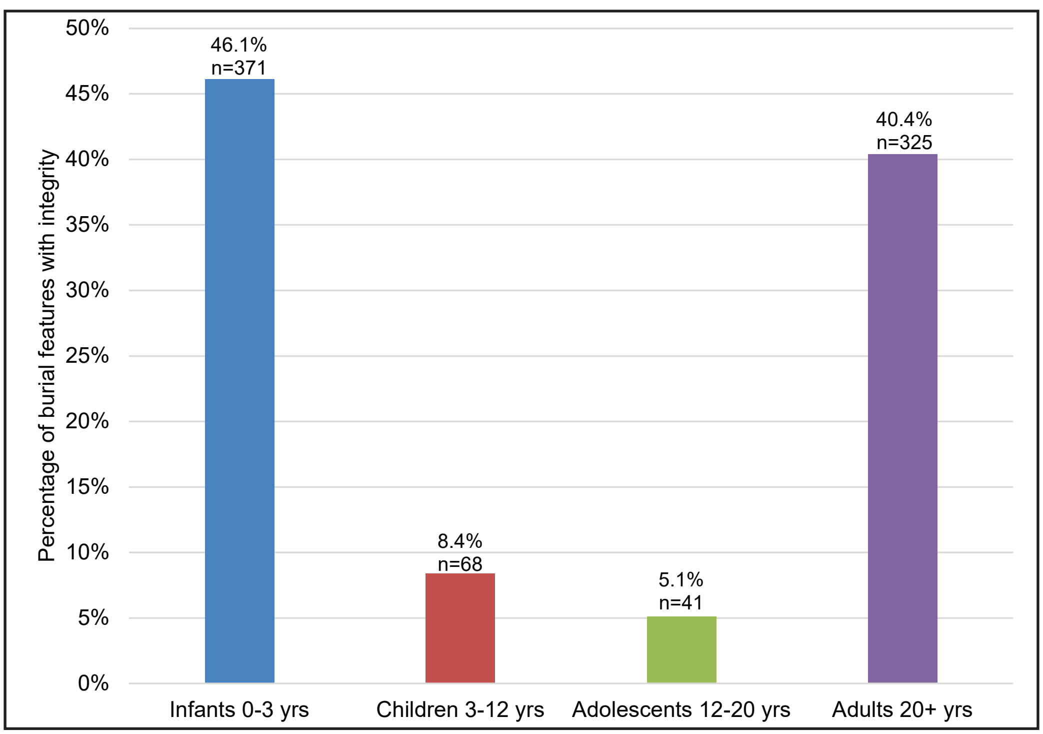

Figure 9.1. Graph showing the age distribution of individuals in intact and relatively intact burial features at the Third Street Cemetery.

9.1.2. SPATIAL DISTRIBUTION OF ADOLESCENTS

Despite the lack of total station electronic mapping equipment available during fieldwork, an accurate map of the excavated burials was created in the ArcGIS computer program using data recorded by the GPS units and measurements documented in field notes and sketch maps (Figure 9.2). A visual examination of the spatial distribution of the adolescent burials at Third Street revealed little patterning. Only two adolescents were buried along the western boundary of the cemetery, in the areas identified as Subadult Concentrations 1 and 2 in the original project report (Mack 2013d:82-83). The majority of the individuals buried in these areas were infants, so the lack of teenagers is not surprising. The area with the highest concentration of adolescents is indicated by the green arrow in Figure 9.3. Here, Burials 349A, 361B, and 369 were found in close proximity to one another. However, this grouping is likely not significant. A total of eight individuals were buried so closely together in this area that separate grave shafts were not discernible, though variations in depth indicate that this was not a mass grave. Since no commonalities were found in coffin hardware or grave goods, this does not appear to be a family grouping, either. The area was interpreted as ground set aside for single-lot sales, perhaps during an outbreak of disease or a period of high mortality.

The blue arrow in Figure 9.3 points to the locations of Burials 24 and 287, which contained the remains of the only identified adolescents in the cemetery, siblings John Joseph and Ellen Blake (Mack 2013f:265-278). The adolescents in the side-by-side graves indicated by the red arrow (B913-2 and B914-1) may also be siblings, based solely on proximity and morphological traits (lambdoid ossicles, spina bifida occulta). The adolescent burial shown to the northeast of the project area was among the four graves incidentally discovered during the installation of a retention wall on an adjacent property in 1994.

Figure 9.2. Aerial photograph of the Third Street Cemetery, showing the graveyard boundaries (yellow), the 2007-2011 project area (red), and the locations of the excavated burials (purple dots). Adolescent burials are indicated by a yellow halo. Base map: Bing Maps, Digital Globe, 2018.

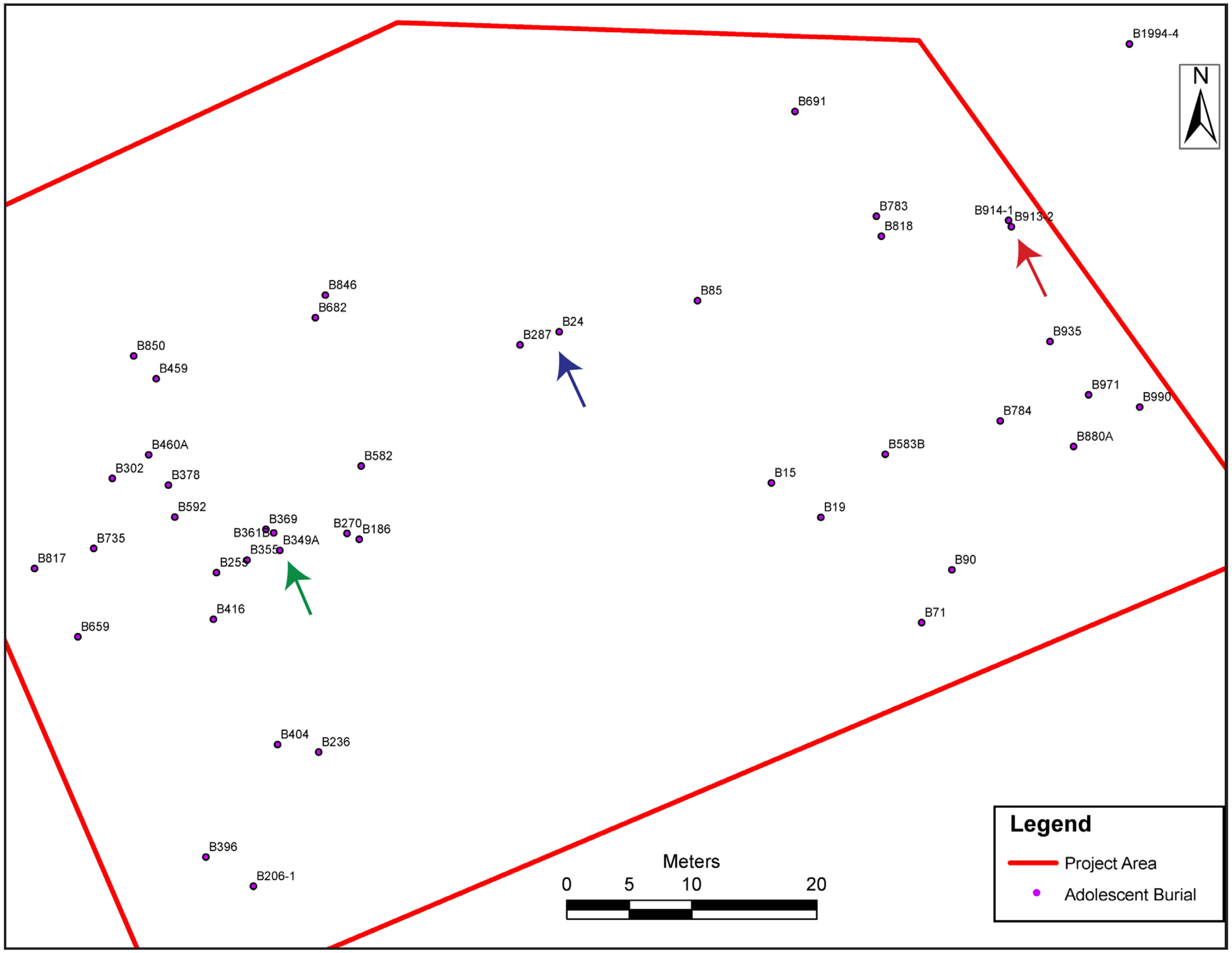

Figure 9.3. Map showing the locations of adolescent burials within the excavated portion of the Third Street Cemetery. Green arrow indicates a concentration in a high-use public lot. Blue arrow points to siblings in the Blake lot. Red arrow marks another set of possible teenage siblings.

9.2. Burial Attribute Comparisons

In order to determine whether or not age-related patterns exist in the distribution of the three selected burial attributes – coffin decoration, burial attire, and grave goods – the frequencies of these variables were first considered separately. Subsequently, combinations of attributes were designated as different burial types, and the frequencies of types were compared between age groups.

9.2.1. COFFIN DECORATION

The evaluation of coffin decoration examined only exterior coffin hardware. Interior decoration elements such as lining fabric, pillows, and coffin lace were not consistently preserved within burials, and therefore could not be considered. Likewise, evidence of outer coffin treatments such a paint, varnish, and fabric-covering was only sporadically preserved. While such treatments undoubtedly affected the visual impact of the coffin at the time of burial, they were not observable consistently enough to be considered during this investigation.

Excavated coffins were divided into three types. Plain coffins were constructed with only utilitarian hardware, including nails and simple screws. Those with no decoration other than white metal coffin screws (see Figure 2.4a) were designated as simple coffins. Though coffin screws are not particularly decorative, their presence indicates an effort to obtain hardware specific to mortuary use or the purchase of a professionally made coffin. Burial containers with domed brass tacks, dummy screws, coffin handles, hinges, viewing panes, caplifters, thumbscrews, escutcheons, ornamental tacks, and/or coffin lid plates, were placed in the third category, elaborate coffins. Some coffin hinges were utilitarian-type rather than decorative items produced specifically for coffins, and some viewing panes appear to have been cut from repurposed glass. Nevertheless, their incorporation into coffin design indicates an extra effort towards displaying the deceased and thus constitutes mortuary elaboration.

Counts of individuals buried in the three coffin types are presented in Table 9.1. Overall, as well as within each age group, about half of the coffins were the plain, undecorated type. Adolescents had the lowest percentage of plain coffins (41.5%, 17/41), but this figure was not found to be statistically significant. Likewise, their higher percentage of elaborate coffins was not significant. However, a chi-square test of independence (χ^2=28.757, df=6, p=0.000) found that infants were more likely to be buried in coffins with simple decoration, if any decorative hardware was chosen. Conversely, when decorative hardware was used for adult coffins, simple coffin screws were less popular than full sets of decorative hardware.

Among adolescents and adults, sex-related differences in coffin hardware elaboration were also investigated. No significant differences were identified. Of the 303 adults for whom sex could be determined, 29% of females (33/113) and 27% of males (52/190) were buried in elaborate coffins. Of the 23 sexed adolescents, the rates were 40% for females (6/15) and 50% for males (4/8).

Table 9.1. Distribution of individuals buried in each of the three types of coffins observed at the Third Street Cemetery, divided by age class.

Age Class	# of burials	# of plain coffins	% plain	# of simple coffins	% simple	# of elaborate coffins	% elaborate
Infant	371	178	48.0	131	35.3	62	16.7
Child	68	35	51.5	18	26.5	15	22.0
Adolescent	41	17	41.5	10	24.4	14	34.1
Adult	325	171	52.6	64	19.7	90	27.7
Total:	805	401	49.8	223	27.7	181	22.5

9.2.2. BURIAL ATTIRE

Burial attire was classified into two categories, shrouds/gowns and day wear. Shrouds/gowns include simple, loose garments that resemble sleepwear, whether the gown was worn for sleeping during life, was sewn specifically for burial, or was purchased for funeral use from a mortuary catalogue. The absence of clothing fasteners, the presence of only copper straight pins, or the recovery of only a single type of light-coloured button (Prosser, shell, bone, or wood) was considered evidence of burial in a shroud. However, if multiple button types were present – two white Prosser buttons and two shell buttons, for instance – or a combination of buttons with other clothing fasteners (buckles, snaps, hooks and eyes), it was assumed that the individual was buried in an outfit composed of multiple garments, which is consistent with day wear. Day wear was also evidenced by the presence of metal buttons, which were not used for sleepwear or shrouds, decorative buttons, or decorative accents such as beading or collar studs.

The results of the burial attire analysis are presented in Table 9.2. Infants were found to be buried in day wear at a significantly lower rate than all other age groups (χ^2=75.755, df=3, p=0.000), but this finding is not surprising, as simple gowns constituted day wear, sleepwear, and burial clothing for individuals in this age category (Aldridge 2008:88-93). Adolescents were more likely than children to be buried in day wear, but no more likely than adults.

Again, adolescent and adult burials were investigated for sex-related differences in burial attire. Of the 303 sexed adults, 25% of females (28/113) and 32% of males (60/190) were buried in day wear. Of the 23 sexed adolescents, the rates were 27% for females (4/15) and 50% for males (4/8). These differences were not found to be statistically significant.

Table 9.2. Distribution of individuals from the Third Street Cemetery buried in shrouds versus day wear, divided by age class.

Age Class	# of burials	# with shrouds	% with shrouds	# with day wear	% with day wear
Infant	371	352	94.9	19	5.1
Child	68	54	79.4	14	20.6
Adolescent	41	26	63.4	15	36.6
Adult	325	234	72.0	91	28.0
Total:	805	667	82.9	138	17.1

9.2.3. GRAVE GOODS

Grave goods are divided into two categories, secular and religious. Religious grave goods include rosaries, chaplets, religious medals, crosses, crucifixes, and remnants of children's flower wreaths on the cranium or torso. Secular grave goods include any items not related to the coffin, attire, or canonical religious beliefs.

Secular Grave Goods

Personal items were rarely recovered from graves in the Third Street Cemetery. Only seven burials included nonreligious items that were unrelated to apparel (Table 9.3), and these objects were not found in the graves of infants or children. With such low numbers, statistical analysis is of limited utility. However, with closer examination it is possible to hypothesise both intent and meaning for many of these objects.

Table 9.3. Secular grave goods recovered from adolescent and adult graves at the Third Street Cemetery.

Burial #	Age	Sex	Object	Location	Inclusion type	Interpretation
206-1	17.5-19.5	Female	Scissors	Left of cranium	Intentional	Personal?
361B	16.0-17.5	Male	2 quarter dollars	Eye sockets	Intentional	Folk belief
396	17.0-20.5	Female	Ambrotype photo	Right of cranium	Intentional	Personal
420	Old adult	Male	Harmonica	Under chin	Intentional	Personal
534	Middle-old adult	Male	Pocket knife	Along proximal left femur	Accidental?	Accidental/ personal?
628	Old adult	Male	Half-dime, quarter dollar	Between proximal femora	Accidental?	Accidental/ folk belief?
749	Old adult	Female	Whiteware plate	Left of waistline	Intentional	Folk belief?

The sex distribution of individuals buried with secular grave goods is close to even, with four males and three females. The distribution by older age class also appears fairly even, with four adults and three adolescents. Taking into account overall representation in the cemetery, however, adolescents were more frequently buried with secular grave goods (7.3%, 3/41) than adults (1.2%, 4/325), a pattern found to be significant by Fisher's Exact Test (p=0.033). The individuals buried with nonreligious objects cluster in two more specific age groups. The adolescents are all older teenagers on the verge of adulthood, while the adults are individuals who reached old age.

One key to the interpretation of these artefacts lies in their locations within the coffins. Four of these objects were placed in the vicinity of the cranium, which can be interpreted as an intentional display. Unless these objects were placed underneath coffin pillows, they would have been visible to mourners until the coffin was closed or the viewing pane was covered. All three of the adolescent burials exhibit this intentional display characteristic. A large pair of scissors was placed to the left side of the cranium of the girl in Burial 206-1, while an ambrotype photograph (produced ca. 1854-1866) was placed to the right side of the cranium of the girl in Burial 396 (Figures 9.4 and 9.5). Whoever prepared the body of the boy in Burial 361B placed Seated Liberty quarter-dollars (dated 1856 and 1858) on his eyes (Figure 9.6).

Figure 9.4. Close-up image of the adolescent female in Burial 206-1, who was buried with large scissors to the left of her head. Image used with permission from the University of Iowa Office of the State Archaeologist.

Figure 9.5. Close-up image of the adolescent female in Burial 396, who was buried with a framed ambrotype photograph to the right of her head. Image used with permission from the University of Iowa Office of the State Archaeologist.

Figure 9.6. Close-up image of the adolescent male in Burial 361B, who was buried with Seated Liberty quarter-dollars on his eyes. Image used with permission from the University of Iowa Office of the State Archaeologist.

The image of the ambrotype photograph was not preserved, but likely depicted a family member or members who, in this way, could accompany the young woman and provide comfort in the grave. Photographs of loved ones are commonly included in coffins in modern America and have been interpreted as a means for preserving connections for forcibly displaced people (Harper 2012:51-53). The intention behind the inclusion of the scissors is less obvious. They could represent a favourite activity or well-known talent or simply a prized possession. Dalrymple's collection of American photographs from the 1870s includes an image of a teenage (apparently) girl with an ornament in the form of miniature scissors hanging from her bodice (Dalrymple 1991:Plate 124). The meaning of the scissors is unclear in the portrait context, as well. The possibility that the scissors in the coffin are related to an unrecorded folk belief cannot be ruled out. The placing of coins on the eyes is clearly an expression of folk belief. In European and African-American tradition, coins were placed on the eyes of the deceased (or elsewhere in the coffin) to hold the eyelids shut and/or to pay a fee for transportation or entry in to the afterlife (Coffin 1976:97; Davidson 2004:310-317; Mainfort and Davidson 2006:200, 217-218; Puckle 1926:50-52). Since pennies are commonly used for this purpose, the substitution of high value coins in this young man's grave was likely meaningful to the family.

The half-dime (date illegible) and the 1853 quarter-dollar found between the proximal femora of the older man in Burial 628 are more difficult to interpret. The location indicates that the coins were deep in the pocket of the man's trousers. Therefore, the coins may have been overlooked while dressing the deceased and accidentally included in the grave. Alternatively, they may have been concealed by someone attempting to follow folk tradition while appearing to comply with the proscriptions of the Catholic Church. Interestingly, only two of the individuals with secular grave goods were also buried with religious items, Burials 206-1 and 749.

Burial 749 provides another possible example of folk tradition expressed in grave goods. The older woman in this grave was buried with a small whiteware plate between her left ilium and left elbow, a location that would have been fully visible when the coffin was open (Figure 9.7). Mooney's treatise on the funeral customs of Ireland mentions the tradition of placing a plate of tobacco or salt near the corpse or on its chest during the wake (Mooney 1888:268-269). He does not mention the inclusion of the plate in the coffin, but it is possible that the whiteware in Burial 749 is related to this practice. Other uncommon features of this burial include the abnormal flexed arm position and the disarticulation of the lower legs (with no evidence of animal disturbance), both of which suggest unusual circumstances in the interment of the deceased. One possible explanation for the abnormal bone positioning is a long post-mortem interval prior to burial resulting in differential decomposition. Such decay would occur, for instance, if the lower legs were exposed by spring thaw while the rest of the body remained covered in thick snow or ice (Lillie and Mack 2015:104).

Figure 9.7. Close-up image of the old adult female in Burial 749, who was buried with a whiteware plate near her left hip. Image used with permission from the University of Iowa Office of the State Archaeologist.

The only adult buried with an object that was clearly a displayed personal possession was the man in Burial 420, who was found with a harmonica near the mandible (Figure 9.8). The position of the object in relation to the body leaves little doubt that the deceased played the instrument in life, and that it represents both a personal possession and a symbol of a role in the community. The pocket knife found in Burial 534 was also likely a personal object used by the deceased man during his lifetime. However, its position in the grave leaves mourner intent uncertain. The knife was found lateral to the proximal left femur, indicating the object was concealed in a trouser pocket, unseen by mourners (Figure 9.9). It is unlikely that a heavy object like a knife would be overlooked in a pocket during the dressing of a corpse, so it is possible that the knife was intentionally placed by a loved one. It is also possible that this man was buried in the clothes he wore at the time of death, as was often the case in the interment of strangers and accident victims (Richards 1997:218-250).

Figure 9.8. Close-up image of the old adult male in Burial 420, who was interred with a harmonica near his mandible. Image used with permission from the University of Iowa Office of the State Archaeologist.

Figure 9.9. Close-up image of the middle-aged to old adult male in Burial 534, who was interred with a pocket knife in his left trouser pocket. Image used with permission from the University of Iowa Office of the State Archaeologist.

All of the individuals buried with secular objects were also buried in clothing interpreted as day wear. This connection is noteworthy, as the inclusion of personal items and coins is more consistent with mourners' ideation of death as a journey than with the notion of a direct ascent into heaven or with the metaphor of death as sleep. These concepts will be explored more fully later in this chapter.

Religious Grave Goods

For the purpose of this comparison, religious items, regardless of number, were recorded simply as present or absent. The results are presented in Table 9.4. Though adolescents appear to have been interred with religious objects at a slightly higher rate than other age groups, and children at a somewhat lower rate, these differences were found to be statistically insignificant ($\chi^2=6.542$, df=3, p=0.088). On average, around 20% of the coffins at Third Street contained at least one object related to Catholic beliefs.

Table 9.4. Distribution of individuals from the Third Street Cemetery buried with and without religious grave goods, divided by age class.

Age Class	# of burials	# without religious grave goods	% without	# with religious grave goods	% with
Infant	371	296	79.8	75	20.2
Child	68	61	89.7	7	10.3
Adolescent	41	30	73.2	11	26.8
Adult	325	250	76.9	75	23.1
Total:	805	637	79.1	168	20.9

The frequency of the appearance of religious grave goods exhibits a slight sex-related bias. Of the sexed adults, 31% of females (35/113) and 18% of males (34/190) were buried with religious objects, a difference that a chi-square test of independence found to be significant (χ^2=6.892, df=1, p=0.009). Among the adolescents, 53% of identified females (8/15) had religious grave goods, while none of the identified males did (p=0.019, Fisher's Exact Test). This bias towards females is not unexpected, as the original project report noted that adult females were buried with rosaries more often than males were, likely due to the predominantly female membership of rosary societies (Mack 2013e:233; Miller 2002:20). Additionally, though infants and young children of both sexes were traditionally buried with wreaths, the only adult found with remnants of wreath wire was female, and two of the three adolescents were also female. Sex could not be determined for the third adolescent.

During fieldwork, it was noted that religious objects were often found in graves with no clothing fasteners and no decorative hardware. Field crew theorised that the individuals in these plain burials might be nuns, but background research revealed that members of religious orders were rarely interred at the Third Street Cemetery. An attempt to determine whether or not religious grave goods were more often associated with plain, "pious" burials discovered that the opposite is true. Table 9.5 shows the numbers of graves with and without religious objects, as found with various combinations of the other burial attributes recorded in this study.

Table 9.5. Numbers of individuals from the Third Street Cemetery exhibiting various combinations of burial attributes, divided by age class. Bolded percentages in the bottom row show the frequency of religious grave goods for the burial type overall, with age classes combined.

Age Class	Plain coffin, shroud				Plain coffin, day wear				Simple coffin, shroud			
	# w/o religous object	% w/o	# w/ religious object	% with	# w/o religous object	% w/o	# w/ religious object	% with	# w/o religous object	% w/o	# w/ religious object	% with
Infant	138	81.2	32	18.8	7	87.5	1	12.5	99	79.8	25	20.2
Child	31	96.9	1	3.1	1	33.3	2	66.7	12	85.7	2	14.3
Adolescent	11	78.6	3	21.4	3	100.0	0	0.0	7	87.5	1	12.5
Adult	103	81.1	24	18.9	35	79.5	9	20.5	37	82.2	8	17.8
Total:	283	82.5	60	**17.5**	46	79.3	12	**20.7**	155	81.2	36	**18.8**

Age Class	Simple coffin, day wear				Elaborate coffin, shroud				Elaborate coffin, day wear			
	# w/o religous object	% w/o	# w/ religious object	% with	# w/o religous object	% w/o	# w/ religious object	% with	# w/o religous object	% w/o	# w/ religious object	% with
Infant	5	71.4	2	28.6	44	75.9	14	24.1	3	75.0	1	25.0
Child	2	50.0	2	50.0	8	100.0	0	0.0	7	100.0	0	0.0
Adolescent	2	100.0	0	0.0	3	75.0	1	25.0	4	40.0	6	60.0
Adult	12	63.2	7	36.8	47	75.8	15	24.2	16	57.1	12	42.9
Total:	21	65.6	11	**34.4**	102	77.3	30	**22.7**	30	61.2	19	**38.8**

A total of 12 burial types are shown in Table 9.5, with the plainest burials (no coffin hardware, shroud-type clothing, no religious objects) on the upper left and the most elaborate burials, with decorative coffin hardware, day wear, and religious objects, on the lower right. The bottom row gives the frequency of absence/presence of religious grave goods for each combination of coffin and attire type, with all ages combined. These percentages show a trend of greater frequency of religious objects in conjunction with increasing levels of display. For each coffin type, religious objects are more frequently found with individuals dressed in day wear than in shrouds. As the coffin type becomes more elaborate, there is an increase in the percentage associated with religious grave goods. A higher number of plain burials included religious objects when compared with other burial attribute combinations, but this is due to the overall larger number of "plain" burials, rather than an association between religious objects and lack of mortuary display. This apparent pattern was tested by performing logistic regression to determine which other variables have a significant association with religious grave goods. Age and the presence of secular grave goods were found to be unrelated ($p=0.824$ and $p=0.992$, respectively), while coffin decoration ($p=0.007$) and burial attire ($p=0.023$) were found to be predictors for the presence of religious objects, with odds ratios of 1.68 and 1.77, respectively.

9.3. Age and Burial Types

With the variable of religious grave goods eliminated as unrelated to age, the study focused on six possible burial types combining the remaining two attributes, burial container and burial clothing. The number and percentage of individuals assigned to each burial type is found in Table 9.6 and the proportion of individuals within each age class is shown visually in Figure 9.10. The bar representing infant burials in Figure 9.10 is markedly different from the others, owing to the narrow bands representing Burial Types 2, 4, and 6. Nearly all infants were buried in shrouds or gowns, and thus fall under Burial Types 1, 3, and 5. The bars for children, adolescents, and adults are similar, with the primary difference being the lower proportion of Type 1 burials and the higher proportion of Type 6 burials observed for adolescents. A chi-square test of independence performed with the four age classes and six burial types confirmed the statistical significance of the pattern for infants and identified a significantly higher proportion of adults found in Type 2 burials (χ^2=117.909, df=15, p=0.000). Observations concerning adolescent patterns could not be confirmed by this test as expected cell counts were smaller than five. However, Fisher's Exact Test found that adolescents were interred in Type 6 burials with significantly more frequency than adults (p=0.005).

Table 9.6. Number and percentage of individuals from the Third Street Cemetery interred in each burial type, divided by age class.

Age Class	Type 1-plain coffin, shroud		Type 2-plain coffin, day wear		Type 3-simple coffin, shroud		Type 4-simple coffin, day wear		Type 5-elaborate coffin, shroud		Type 6-elaborate coffin, day wear	
	#	%	#	%	#	%	#	%	#	%	#	%
Infant	170	45.8	8	2.2	124	33.4	7	1.9	58	15.6	4	1.1
Child	32	47.1	3	4.4	14	20.5	4	5.9	8	11.8	7	10.3
Adol.	14	34.1	3	7.3	8	19.5	2	4.9	4	9.8	10	24.4
Adult	127	39.1	44	13.5	45	13.8	19	5.9	62	19.1	28	8.6
Total:	343	42.6	58	7.2	191	23.7	32	4.0	132	16.4	49	6.1

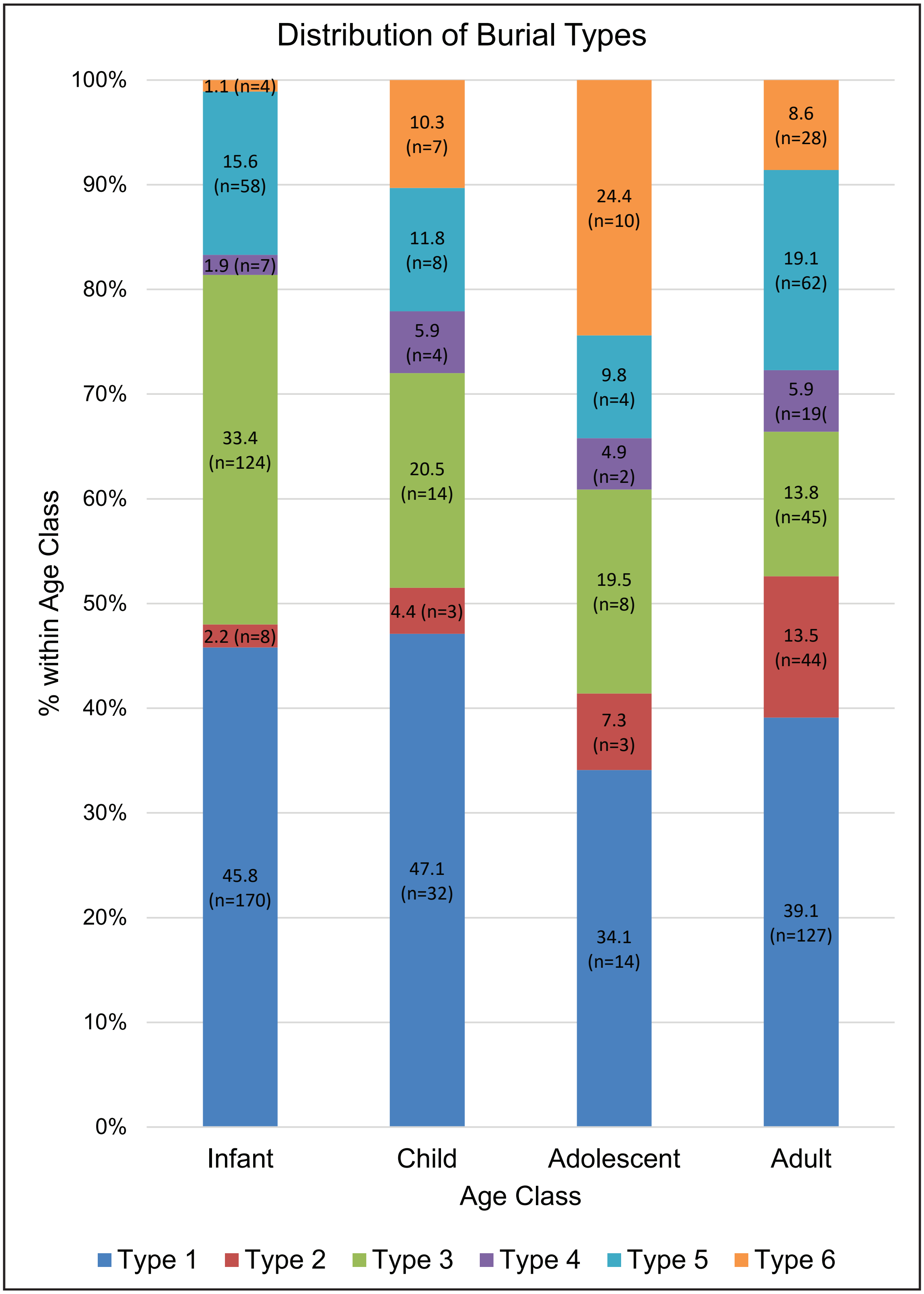

Figure 9.10. Graph showing the percentage of individuals in each age class assigned to the six burial types defined in Table 9.6.

The assumption that mortuary display should increase with the age of the deceased, in proportion to his or her value and importance to the family and the community at large is logical (Saxe 1970:69-71). This spike in mortuary elaboration for individuals who died shortly before achieving adult status does not fit well with such a model, unless emphasis is placed on importance to the family, and value is defined by criteria other than economic or social prominence. An exploration of motivations behind this funerary pattern begins with a closer look at the highest-display adolescent burials from the Third Street Cemetery.

9.4. Adolescents and Mortuary Display

Almost one quarter of the adolescents interred at the Third Street Cemetery (10/41) were recovered from burials exhibiting the highest defined level of display (Table 9.7). All of these individuals had clothing fasteners and/or accessories indicating burial in an outfit composed of multiple garments (day wear) rather than a simple gown or shroud. All of the coffins were constructed with decorative hardware. Consistent with the previously demonstrated connection between high levels of mortuary display and religious grave goods, almost two-thirds of these adolescents were buried with religious objects, though only one teenager on the list was also buried with a personal item.

Table 9.7. Details from the burial features of the 10 adolescents recovered from Type 6 burials (highest display level). Sex is given as male (M), female (F), or indeterminate (Ind.). Age is the midpoint of the osteologically-determined age estimate range.

Burial #	Sex	Age	Coffin Hardware	Burial Attire Remnants	Religious Grave Goods	Secular Grave Goods
1994-4	M	15.5	3 handles, coffin screws	2 plain, 1 large Prosser button	Rosary	n/a
24	M	17.0	Cast iron casket, viewing pane, 6 handles	bowtie or cravat fabric, 2 black Goodyear buttons, 1 Prosser button, 5 metal buttons	n/a	n/a
71	M	16.5	Coffin lid cross, 6 handles, 6 thumbscrews with escutcheons, 17 dummy screws	1 Prosser button, 28 metal buttons, collar stud, preserved jacket fabric	n/a	n/a
90	Ind.	15.5	4 handles, 6 coffin screws	1 Prosser button, 1 hook and eye	Miraculous Medal (French)	n/a
206-1	F	18.5	Viewing pane, coffin lid cross, 6 handles, 10 thumbscrews with escutcheons, 30 ornamental tacks	Beading in heart-shaped pattern, silk ribbons, 3 Prosser buttons, 1 metal button	Religious medal	Shears
349A	F	13.75	Coffin lid cross, 4 handles, 14 thumbscrews with escutcheons, 14+ ornamental tacks	2 Prosser buttons, 5 copper pins, 2 shoes with beads, 1 finger ring	Wreath wire, rosary, religious medal	n/a
355	Ind.	15.5	Coffin lid cross, 5 coffin screws	8 Prosser buttons, 1 hobnail button	n/a	n/a
783	F	16.5	Coffin lid cross, 6 handles, 14 thumbscrews, escutcheon frags., 2 hinges, 23 ornamental tacks	4 shell buttons, 1 brooch/pin	Religious medal	n/a
818	M	18.5	Viewing pane, 3 caplifters, coffin lid cross, 6 handles, 10 thumbscrews with escutcheons, 24+ ornamental tacks	2 Prosser buttons, 7 shell buttons, silk bow tie, portion of cotton jacket collar preserved with stiffener	n/a	n/a
914-1	F	17.25	3 handles, 1 coffin screw	2 Prosser buttons, 1 hook and eye	Rosary (celluloid plastic)	n/a

The sex distribution of the adolescents from Type 6 burials is even, with four males, four females, and two individuals of indeterminate sex. Based on the midpoint of the age estimate range for each skeleton, all of these individuals would have been considered social adolescents, with all females between the ages of 13 and 18, males between the ages of 15 and 19, and those of indeterminate sex aged 15 to 18 years.

Unfortunately, the social age of many of the other osteological adolescents from Third Street is uncertain. In cases in which sex is indeterminate or hesitantly assigned and/or in which the age range is wide, it is possible that individuals classified in this study as adolescents would have been considered boys (males aged 13 to 14 years) or young women (females aged 19 to 20 years) in nineteenth-century Dubuque. Just over one-third (15/41) of the adolescent burials included in this examination of mortuary behaviour could belong to individuals who were socially children or adults. In order to determine whether or not this possible error affected the outcome of the burial type classification, the 41 adolescents were further divided into three age groups, using midpoint age estimates. Thirteen- and fourteen-year-olds, who may have been considered children (if male), were placed in one group (n=11), and 19- to 20-year-olds were placed in another (n=8). The remaining 22 individuals, aged 15 to 18 years, were unquestionably adolescents. In Table 9.8, the number and percentage of teenage individuals interred in the six burial types is divided into these three more specific age groups. The distribution of burial types including these new age divisions is presented visually in Figure 9.11.

Table 9.8. Number and percentage of teenagers from the Third Street Cemetery interred in each burial type, divided by adolescent age group.

Age	Type 1 plain coffin, shroud		Type 2 plain coffin, day wear		Type 3 simple coffin, shroud		Type 4 simple coffin, day wear		Type 5 elaborate coffin, shroud		Type 6 elaborate coffin, day wear	
	#	%	#	%	#	%	#	%	#	%	#	%
13-14 yrs	5	45.4	1	9.1	3	27.3	1	9.1	0	0	1	9.1
15-18 yrs	6	27.3	2	9.1	1	4.5	1	4.5	3	13.7	9	40.9
19-20 yrs	3	37.5	0	0	4	50	0	0	1	12.5	0	0
All adolescents	14	34.1	3	7.3	8	19.5	2	4.9	4	9.8	10	24.4

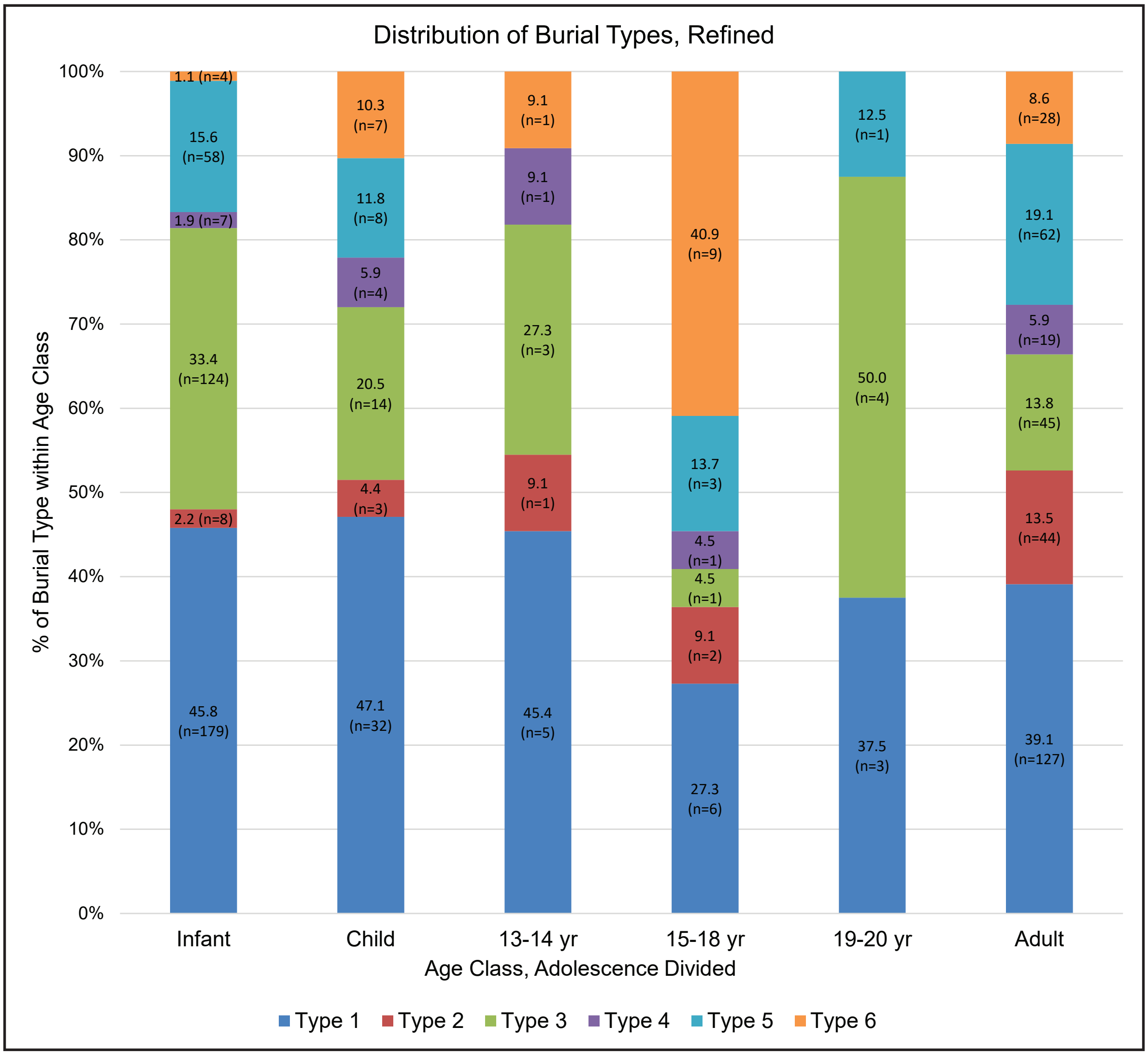

Figure 9.11. Graph showing the percentage of individuals in each age class assigned to the six burial types, with adolescence divided into three age groups.

Though samples sizes for the three adolescent age groups are very small, the results demonstrate that the frequency of high mortuary display among adolescent burials is not a function of the misclassification of young adults as teenagers. Almost 90% (7/8) of the older adolescent/young adults were interred in Type 1 or Type 3 burials (low display level), and none were found in Type 6 burials. The profile of burial type frequencies for 13- to 14-year-olds most closely resembles that of children, except for the lack of Type 5 burials. It is possible that some of the individuals in this young age group were not social adolescents, but again, their numbers do not substantially contribute to the high level of mortuary display observed for adolescents overall. Over 50% (12/22) of the "definitive" adolescents (15 to 18 years) were interred in the two highest display burial types (Type 5 and Type 6). These results demonstrate that social adolescents were indeed the focus of elaborate mortuary treatment in this population.

In order to determine whether or not these adolescent burials exhibit any unique characteristics other than a greater tendency towards high-level display, specific features of the Type 6 burials were examined. Though no significantly greater expenditure of money or time was evidenced by the mortuary treatment arranged for adolescents, details of the reconstructed funerary tableaus provide insight into the principle mourners' conceptions of death and loss.

9.4.1. ADOLESCENT COFFIN SELECTION

Early in the current study, preliminary investigations into adolescent burials at the Third Street Cemetery looked at frequencies of specific types of coffin hardware, but no patterns were identified which set adolescents apart from adults. Coffin handles, viewing portals (panes or hinges), coffin lid crosses/plates, and even remnants of coffin linings were associated with both age groups at roughly the same rates. No specific decorative motifs were identified for adolescents, unlike infants and children, whose coffin handles often took the forms of lambs or cherubim. Adolescents were no more or less likely than adults to have coffin trimmings with religious iconography. Essentially, when mourners chose a burial container for an adolescent, they appear to have followed the same decision-making process as when selecting an adult coffin.

Mourners in nineteenth-century Dubuque had three types of coffins to choose from, which are represented by the three types assigned during analysis. An undecorated coffin constructed from all-purpose hardware may indicate home manufacture, an option which might be chosen regardless of economic standing. Alternatively, a plain coffin could have been professionally made and simply date to the early period of the cemetery, as coffin-specific hardware would not have been widely available until the early 1850s (Springate 2015:24). Of course, plain coffins were also selected by the poor, and can represent minimal expenditure by a religious organisation (such as the St. Vincent de Paul Society) on the burials of paupers, strangers, and executed criminals.

The addition of white metal coffin screws, which categorizes the second type of coffin, does not create much visual impact. Furthermore, the presence of coffin screws does not necessarily indicate a significant increase in the cost of the coffin. The wholesale price of a gross of the simplest white-metal coffin screws in 1866 was $1.20, while a gross of plain woodscrews was $0.478 (Hardy 1895:Table II; P. & F. Corbin 1866:38). Though the price of a coffin screw was two and a half times higher than that of a utilitarian screw, it still cost less than a penny. The use of coffin screws on a homemade burial container would have little effect on the overall cost. However, the presence of coffin screws indicates that a burial container was likely manufactured professionally by someone with access to specialty hardware, whether a local carpenter or dedicated coffin maker. Additionally, the decision to use decorative coffin screws for closure rather than banging nails into the lid of an occupied coffin speaks to the sensibilities of the mourners. Thus, coffin screws carry greater meaning than their appearance or cost would suggest.

Around 50% of the individuals in each age class were interred in plain coffins (41% for adolescents, 17/41), but the proportions of burials with coffin screws were variable (Table 9.1). For both infants and children, burial containers with simple coffin screws were more common than those with additional decorative hardware. For adolescents and adults, the numbers of coffins with elaborate decoration were greater than those with simple coffin screws. Apparently, once the decision was made to purchase a professionally-produced coffin, families were more likely to invest in extra trimmings for adolescents and adults.

Decorated coffins are not necessarily an indication of high economic status for the deceased or the mourners. Embellished burial containers could be produced at a relatively low expense by a local carpenter or could be purchased for a high price from a showroom or catalogue. Many of the coffin trimmings were cheaply manufactured, with white metal dummy screws selling wholesale for $0.50 a gross, and white metal coffin hinges costing $0.65 per dozen pairs (P. & F. Corbin 1866:37-38). Regardless of price, the connection of coffins to economic standing is obscured by the fact that some families were willing to incur large debts for the provision of elaborate funerals for loved ones (Cannon 1989:438; Davidson 2004a:171). That this occurred in Dubuque is attested to by funeral bills held by Hoffmann Mortuary, the oldest funeral home in the city. Conversely, the austerity of a coffin might not indicate low economic status, either. A plain burial container might simply reflect a family's sensibilities regarding propriety. A number of studies have focused on the temporal aspect of coffin decoration, demonstrating how the Beautification of Death caused funerary elaboration to peak from the 1860s to the 1880s and to gradually be replaced by funerary restraint by the turn of the twentieth century (Cannon 1989; Little *et al.* 1992; Raemsch and Bouchard 2000). However, since the addition to the Third Street Cemetery was used from around 1856 to 1880, the majority of the excavated graves date to the height of the Beautification of Death period, when decorated coffins were both available and fashionable.

Bell (1990) emphasises that after the introduction of mass-produced coffin hardware, the presence or absence of embellishment on a coffin is largely a matter of consumer choice. The first question, then, is, "Who are the consumers?" The principal mourner in the case of an adult death would likely be a spouse or adult offspring. In either instance, the principal mourner has motive to use mortuary display as an expression of status, as he or she will continue to benefit from the deceased person's status in the community. This status display may be in accordance with the living person's rank or may be aspirational (Cannon 1989:437). When a child dies, the parents are normally the principal mourners. If the motive for elaborate coffins and funerals for offspring were the same as for adults – to perpetuate a family's rank in society through display – then equal proportions of decorated coffins should be found for infants and children, as well as adolescents. In fact, one might expect the percentage of infant coffins with embellishment to be larger than that of adolescents, since the families inclined towards lavish mortuary display would likely have greater numbers of infants than teenagers in the cemetery (owing to the demonstrated high infant mortality in Dubuque). However, this is not the case. The greater frequency of elaborate adolescent burials at Third Street suggests that families who could afford embellished coffins (or who could get them on credit) preferentially chose to provide them for children at the threshold of adulthood rather than for all offspring.

Mortuary Aging: The Little Lady in Burial 349A

The placing of adolescents in adult burial containers can be interpreted as a form of status aspiration different from that described by Cannon (1989), one which allows parents to display their children as the adults they should have become. This "mortuary aging" is particularly evident in Burial 349A. The girl in the coffin was approximately 13.0 to 14.5 years old, and was prepubertal or possibly in early puberty. Her coffin was only 5 feet, 4 inches long (162 cm) but was ornamented with a large coffin lid cross (covering two-thirds of her torso), four coffin handles, 14 thumbscrews with escutcheons, and 14+ ornamental copper crucifix tacks (Figure 9.12). Little can be said about her burial dress, as only two different-sized Prosser buttons (possibly from undergarments) were found along with five copper pins that were likely used to arrange dress fabric around her body. Remnants of high-heeled shoes with black, blown-glass beads were found on her feet and a copper-alloy ring was discovered on the index finger of her right hand (Figure 9.13). Both shoes and rings were extremely rare at the Third Street Cemetery. Of the 12 individuals buried with rings, all were adults except for the girl in Burial 349A. She was also buried with a glass-bead rosary in her hands and an illegible religious medal at her waist. However, in contrast with her womanly accoutrements, bits of wire were found around her cranium. The parents (presumably) who prepared her body for the funeral displayed her as a small adult, while at the same time conforming to the Catholic tradition of burying children with flower crowns. This reconstructed funeral vignette stands in sharp contrast with the post-mortem photograph of 13-year-old Woodson Thompson which appears in Burns' (1990:Plate 64) published collection of American memorial photographs. The young man, who was hit by a train in 1889, is laid out in a white coffin with white lining fabric, with no coffin hardware visible beyond coffin handles. His white or light-coloured outfit is obscured by a large bouquet but resembles, in its simplicity, a "boys lawn robe" sold in the Wayne Hardware Co. mortuary catalogue (1874:57), with fewer details and trimmings than similar robes marketed for "gents" (Figure 9.14). Though they were close in age, the female in Burial 349A was buried as a woman, while Woodson was buried as a boy.

Figure 9.12. Field photograph of the 13.0-14.5-year-old female in Burial 349A, showing the large coffin lid cross and other decorative hardware. Image used with permission from the University of Iowa Office of the State Archaeologist.

Figure 9.13. Photograph showing the buttons and remnants of beaded leather shoes found in Burial 349A at top, with ring, wreath wire, religious medal, and rosary fragments at bottom. Image used with permission from the University of Iowa Office of the State Archaeologist.

J. L. WAYNE & SON.

ROBES.

No. 41, Boys' Lawn. Length 54 inches.
Age 9 to 10 years.

No. 48, Girls' White Corded Alpaca. Length 48 inches.
Age 7 to 9 years.
47, same style. Length 36 inches. Age 2 to 4 years.
52, same style. Length 54 inches. Age 9 to 10 years.
50, Girls' White Merino. Length 48 inches. Age 7 to 9 years.

No. 53, Boys' White Merino. Length 54 inches. Age 9 to 10 years.
45, same style. Length 48 inches. Age 7 to 9 years.
43, same style. Length 36 inches. Age 2 to 4 years.

No. 15, Gents' Lawn, Faced with Embossed Satin. Length 75 inches.
11, of same style, Faced with Stamped Silk. Length 75 inches.

No. 17, Gents' White Merino, Faced with Stamped Silk. Length 75 inches.
33, same style, Plain. Length 75 inches.

No. 27, Gents' Black Cloth Suit. Length 75 inches.
29, same style, Silk Faced. " 75 "
23, same style, of Black Merino, " 75 "
25, " " " " " Silk Faced. Length 75 inches.
31, " " " Brown Lustre. " 75 "
19, " " " Black Cashmere. " 75 "
21, " " " " " Silk Faced. " 75 "

—: 57 :—

Figure 9.14. Page from the Wayne Hardware Co. catalogue (1874:57) showing a simple boys' style burial robe (upper left), as well as elaborate, smock-type burial suits for men (bottom row).

Chronic Disease and Mortuary Display: Two Red Coffins (Burials 206-1 and 818)

One of the research questions posed in this thesis is whether or not mortuary treatment varies according to the manner of death. As no adolescents exhibit evidence of perimortem trauma, it is only possible to consider individuals with signs of chronic illness. A connection between chronic illness and elaborate mortuary treatment is logical, as an expected death provides more time for funeral preparations such as custom-ordering a coffin. However, a comparison of the 10 teenagers with evidence of chronic disease (Table 7.20) and the 10 with Type 6 burials (Table 9.7) finds only four individuals on both lists, the adolescents in Burials 206-1, 355, 783, and 818. Three of the four individuals' coffins incorporated all of the available decorative hardware types: coffin lid crosses, handles, thumbscrews, escutcheons, and decorative tacks. All three burial containers had viewing portals; two had viewing panes and one had ornate hinges. Two of the coffins had very similar coffin hardware and remnants of red paint, which was rarely found at Third Street. Three red-painted adult coffins (Burials 33, 634A, and 834) were also similar in design, with viewing panes, sliver-plated urn-shaped thumbscrews, and coffin handles with cross-shaped lugs. Each of the five red coffins incorporated a slightly different handle design (Figure 9.15), suggesting that the base coffin model could be customised according to the family's taste when ordering. Of the three adult skeletons, however, none showed any markers of chronic disease, though one individual was poorly preserved, and another was sparsely represented by remains left behind during historic disinterment. Thus, there is little evidence for an association between elaborate coffins and chronic disease at the Third Street Cemetery.

Figure 9.15. Coffin handles from five burials at the Third Street Cemetery with similar, red-painted coffins. Adolescents were found in Burials 206-1 (top row, right) and 818 (middle row, left). Image used with permission from the University of Iowa Office of the State Archaeologist.

Practical Considerations: The Blake Siblings (Burials 24 and 287)

Other circumstances surrounding a death can affect the selection of a burial container, as demonstrated by the coffins of John Joseph and Ellen Blake (Burials 24 and 287), the only identified adolescents recovered from Third Street. John Joseph's death announcement states that he died away from home, just a few weeks after moving to St. Louis to attend college at the age of 19. The cause of death is given as "a brief illness." Despite little advance notice of his death, the body was shipped quite quickly. John Joseph died on October 24, and his corpse arrived in Dubuque on the 26th, with the funeral on the afternoon of the 27th (*Dubuque Daily Herald* 1870b; *Dubuque Daily Times* 1870c). He was buried in a cast iron coffin, which represented the maximum expenditure for a burial container (Figure 9.16). The selection of this coffin could have been related to his standing in the family, as he was the last living male heir. However, cast iron coffins were also a sensible choice for transporting human remains long distances at the time. Shipping regulations required that wooden coffins carried by train or steamboat be contained in a lead or zinc box, the weight of which added substantially to shipping costs; cast iron coffins could be shipped without an additional container (Burrell 1998).

John Joseph's father and adult siblings were also interred in expensive burial containers, but his 17- to 20-year-old sister Ellen's coffin was adorned with nothing but five coffin screws. Historic documentation provides an explanation for the disparity. Ellen died sometime between the 1850 Federal Census and the 1856 Iowa Census, during a period when the use of coffin hardware was not as widespread and when coffin screws may have been the only decorative coffin materials on hand (Mack 2013f:266). She was, in fact, interred in the original cemetery lot, which was not part of the excavation project area. However, concerned about the desecration of the original cemetery due to lead mining, her father John Blake had her coffin moved to the newer section of the cemetery shortly before his own death in August 1870 (*Dubuque Daily Times* 1870b).

Figure 9.16. Field photograph of the remains of John Joseph Blake in his cast iron coffin (on left), with portions of the damaged coffin laid out (on right). Image used with permission from the University of Iowa Office of the State Archaeologist.

9.4.2. ADOLESCENT BURIAL CLOTHING

Only three cast iron coffins were recovered from the Third Street Cemetery, two of which (including John Joseph's) were badly damaged by earth-moving activities in the 1940s. The third was found still sealed but was not opened during the project due to concerns of microbe preservation, arsenic contamination (from embalming), and privacy. This loss of data is unfortunate, as the size of the coffin (maximum length 174 cm) suggests it held an older child or younger adolescent. The environment within a sealed iron coffin promotes preservation of fabrics and other organic materials (Brantley 1998; Hintlian 2001; Welker 1999), and thus Burial 331 could have provided a rare glimpse of mortuary attire at Third Street. Fortunately, a few of the adolescent burials contained small amounts of fabric preserved by contact with copper salts or by microenvironments beneath collapsed viewing panes, as well as some unique durable items. These finds provide a more detailed picture of adolescent burial clothing than simple tallies of clothing fastener types.

Burial Attire for Males

Despite the damage to his iron coffin, a lump of dark green fabric representing the central knot of a bow tie (possibly a cravat) was found on John Joseph's neck. Also, a silk, herringbone-patterned, diamond-point bow tie was preserved in Burial 818, directly underneath the viewing pane (Figure 9.17). The rusty brown hue suggests the fabric may have originally been dyed black. The wearing of a neckcloth was not unique to the corpses of teenage boys, of course. Based on post-mortem photography from this time period, it appears that the *absence* of a neckcloth would have been unusual when a male was dressed in day wear for burial; the more elaborate of the men's shrouds sold in catalogues also included neck clothes (Aldridge 2008:67-68; Burns 1990; Wayne Hardware Co. 1874). The fact that neckpieces were preserved only in these two adolescent graves is mere coincidence, though the form may have been related to age. Cravats with knots were popular in America in the mid-nineteenth century, but bowed neckpieces became more common from the 1860s to 1880s. During this period, the size of the bows shrank, as well (Colle 1972:122). The small size of the bow tie in Burial 818 is consistent with fashion in the 1870s, the decade to which this interment is dated based on the thumbscrews (Colle 1972:139-149; Lillie *et al.* 2013:197). As Aldridge (2008:96) points out, younger individuals were quicker to adopt new fashions, while older adults had a tendency to cling to outdated fashions. In dressing this young man for the funeral, his family may have kept his preferences in mind.

Figure 9.17. Field photograph of the brown silk bow tie in situ in Burial 818. Image used with permission from the University of Iowa Office of the State Archaeologist.

The young man's family also appears to have been mindful of the latest funerary trends. A closer examination of the bow tie (Figures 9.18 and 9.19) suggests that it was sewn into shape rather than simply tied. There is no evidence of the fabric strip that would have gone around the back of the neck, and when the torn portion (Figure 9.20) is put in place, all of the bow tie edges are finished. Furthermore, another garment piece was found in direct contact with the back of the bow tie, constructed of two strips of brown cotton twill sewn around a stiffener made of an unidentified material (possibly bone) and copper (Figures 9.18 and 9.21). This piece was interpreted as a shirt or coat collar, but its presence at the centre of the throat suggests this individual was wearing a back-opening, smock-type burial shroud/suit (Davidson 2016:238). Small shell buttons were also found at the front of the neck and running down the torso in a line. The large shell button found at centreline with the lumbar vertebrae may have come from the coat or a false vest. The Prosser buttons found near the lower legs indicate that the young man was buried in his own knicker-style underdrawers, with mismatched button sizing suggesting an earlier repair (Figure 9.22). Analyses of preserved burial garments from iron coffins have demonstrated that corpses were often dressed in layers of undergarments regardless of the choice of outer garments (Brantley 1998; Hintlian 2001; Welker 1999). Though the individual in Burial 818 was classified as wearing day wear based on clothing fasteners, the preserved fabric evidence suggests that the teenager was in fact buried in an elaborate type of shroud, similar to the one seen at bottom right in Figure 9.14, which also incorporates an asymmetrical diamond-point bow tie.

Figure 9.18. Close-up photograph of the silk bow tie and collar fragment from Burial 818. Image used with permission from the University of Iowa Office of the State Archaeologist.

Figure 9.19. Close-up photograph of the underside of the silk bow tie from Burial 818, showing its construction. Image used with permission from the University of Iowa Office of the State Archaeologist.

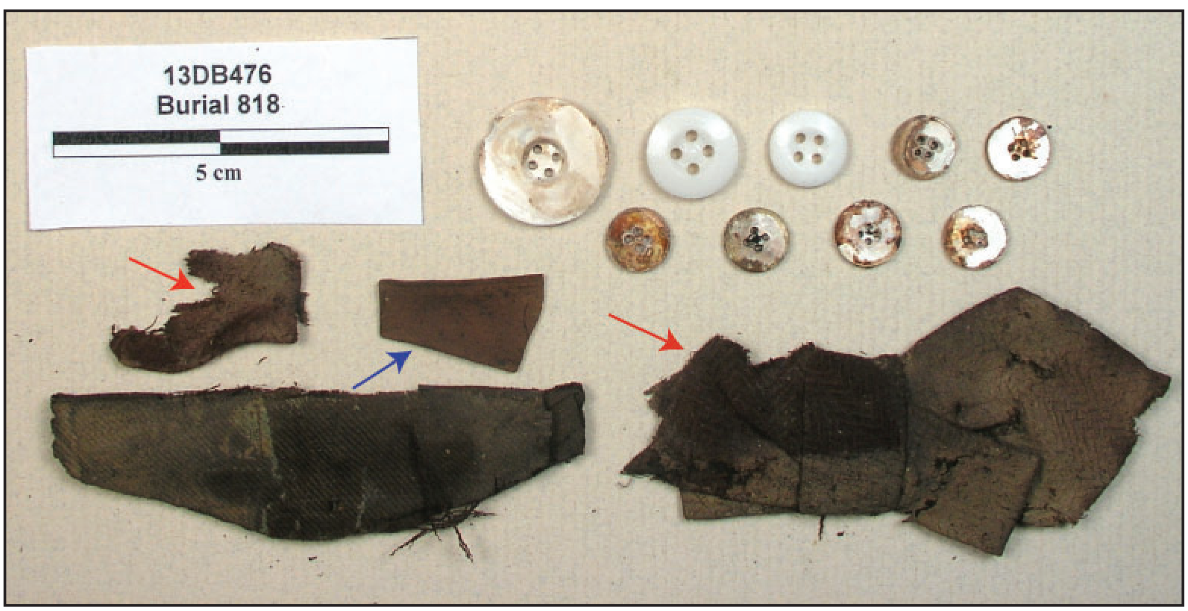

Figure 9.20. Apparel-related artefacts from Burial 818, including one large and six small shell buttons, two Prosser buttons of different sizes, and preserved fabric pieces. The red arrows point to a scrap torn off the bow tie and the original location of that fragment. The blue arrow points to a fragment of stiffener from the collar. Image used with permission from the University of Iowa Office of the State Archaeologist.

Figure 9.21. The crudely-sewn collar piece from Burial 818, opened to reveal the stiffener of bone (?) and copper. Image used with permission from the University of Iowa Office of the State Archaeologist.

Figure 9.22. Close-up field photograph showing the mismatched Prosser buttons found at mid-calf in Burial 818, likely representing underdrawers. Image used with permission from the University of Iowa Office of the State Archaeologist.

Though the configuration of John Joseph Blake's poorly-preserved neck cloth cannot be determined, the buttons found in his burial (Burial 24) set him apart from the rest of the cemetery population. His two black, vulcanised rubber buttons (labelled Novelty Rubber Company, Goodyear patent 1851) were the only such clothing fasteners found in the cemetery, suggesting they were not used on garments sold locally (Figure 9.23). His family may have ordered his clothing from a catalogue, or he may have purchased the item himself during his brief time in St. Louis. Unfortunately, due to disturbance of the right side of the coffin and the loss of the right arm bones, the arrangement of the remaining buttons does not clearly illustrate the garments worn. The two black buttons were found in a line lateral and parallel to the left radius and ulna, close to midshaft, in the vicinity of the left innominate. They were originally interpreted as shirt cuff buttons but could have been part of the waistline of the trousers, either as fasteners or for the attachment of braces. The arrangement of fabric-covered metal buttons is consistent with that of a coat. The Prosser button found at the neck was likely from an undergarment or the part of the shirt not seen under the bow tie.

Figure 9.23. Close-up photograph of artefacts found in Burial 24, including two black vulcanised rubber buttons with the Goodyear patent/Novelty Rubber Company stamp, the knot from a neckpiece, a white Prosser button, one large and four smaller fabric-covered metal buttons, and remnants of coffin lining fabric. Image used with permission from the University of Iowa Office of the State Archaeologist.

Two types of men's accessories – collar studs and cuff links – were found exclusively in adolescent graves at Third Street, with only three examples recovered during the excavation. One of these collar studs was found in Burial 71, which is on the list of adolescent Type 6 burial features (Figure 9.24). In addition to the collar stud, the individual was buried with clothing bearing 28 corroded metal buttons and one small Prosser button (Figure 9.25), the highest number of buttons found in a single grave in the cemetery. Though original analysis identified all of the buttons as "pad shank" type, the photograph appears to show four types of buttons in various sizes: one tack button, three sew-through buttons, plain shank buttons, and three sizes of fabric-covered shank buttons. Based on the field sketch, these buttons correspond to the centre button and button-fly of trousers, the breast and sleeve buttons of a double-breasted coat, and the central button on some type of cap. The plain shank buttons were found at centreline on the chest and could have been sewn on a waistcoat. The shirt below his suit apparently only opened partway down the front, as only one Prosser button was found. The collar stud would have been used to attach a starched white linen or cotton collar to the neck of the shirt, regardless of the colour of the shirt itself. This shirt design was ubiquitous in the 1850s through 1870s, though many collars were attached via buttons sewn on the shirt's neckline rather than with studs (Colle 1972:13; Severa 1995:209, 265, 314). With detachable collars the rule, it is quite surprising that only two collar studs were found at Third Street, and that none were found in adult burials. Based on Victorian photography, it is difficult to judge the prevalence of stud-joined collars relative to buttoned-on collars, as the base of a man's collar was almost always concealed by a neckpiece (Dalrymple 1991; Severa 1995). Given that studs were decorative accessories, they were likely less common than simple Prosser collar buttons in life as well as in the graveyard. As the dressier option, studs should be expected more often in the graves of adult men, who, by virtue of their multiple roles in society and their attainment of more milestones, have more complex obligations to communicate through their clothing (Eicher and Roach-Higgins 1995). However, this was not the case at Third Street.

Figure 9.24. Close-up photograph of collar stud found in Burial 71, the grave of a 15- to 18-year-old male (sex based on clothing artefacts). Image used with permission from the University of Iowa Office of the State Archaeologist.

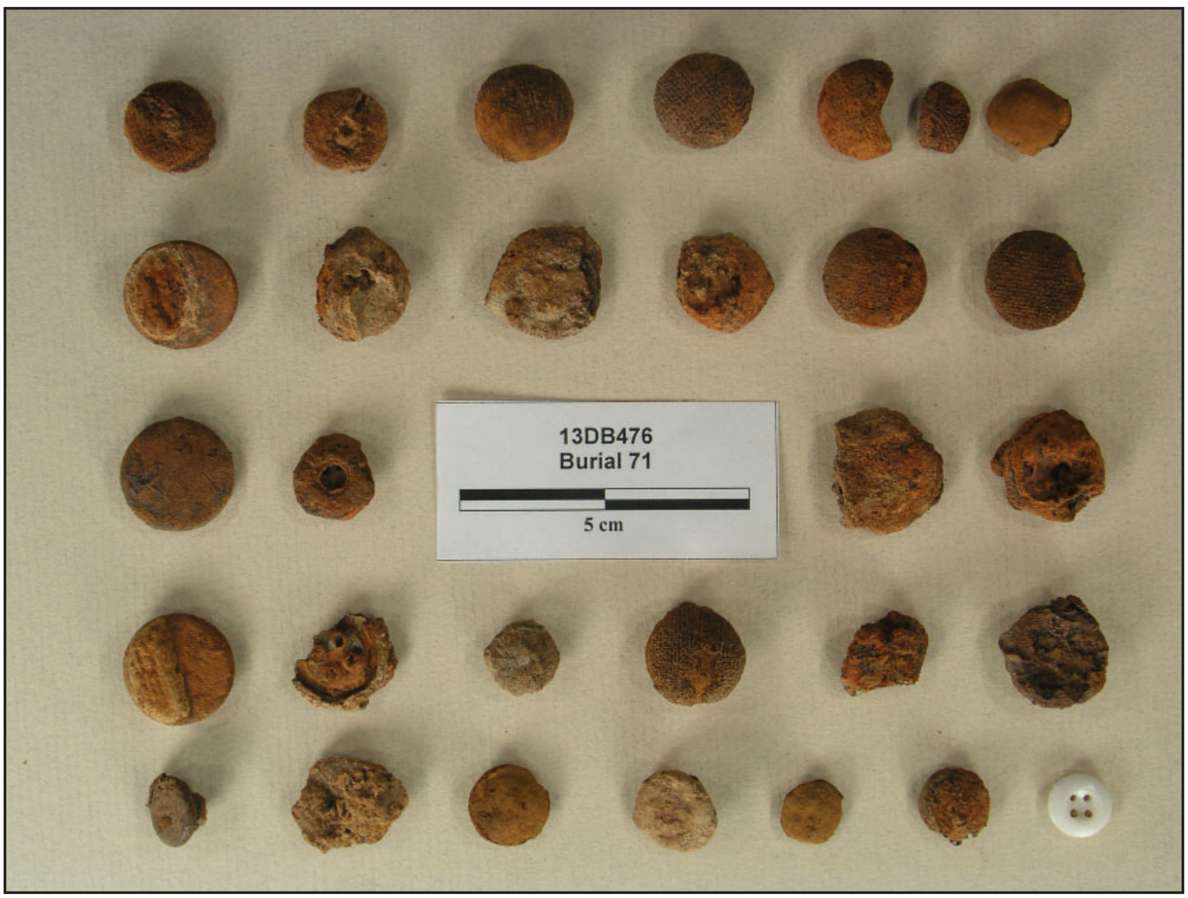

Figure 9.25. Photograph of 28 metal buttons and one Prosser button recovered from Burial 71. Image used with permission from the University of Iowa Office of the State Archaeologist.

According to costume historians, detachable starched linen cuffs were also common by the 1860s, at least among those who wanted to appear presentable but could not afford or be bothered with a change of shirt every day (Jonas and Nissenson 1991:12; Severa 1995:314; Wilcox 1958:296). Though these cuffs, like the detachable collars, could be buttoned on, Jonas and Nissenson (1991) claim that by the mid-nineteenth century "everyone in the middle and upper classes wore cuff links," which, in the 1880s, could be bought for as little as $0.25 a pair (Jonas and Nissenson 1991:13). If cuff links (also called sleeve buttons) were truly ubiquitous, their absence from the graves at Third Street is noteworthy. Only one set of cuff links was recovered, constructed from oval-shaped, red glass buttons in copper-alloy settings with braided decoration running along the edge, joined into each pair by a single copper link (Figure 9.26). The 16.0- to 17.5-year-old male interred with these cuff links in Burial 361B also sported a small, octagonal, gilded collar stud, the embossed design of which was obscured by copper salts. This young man is discussed above as the individual with coins on his eyes (Figures 9.6 and 9.26).

Figure 9.26. Close-up photograph of artefacts found in Burial 361B, including a gold-plated, octagonal collar stud, red glass cuff links, and two Seated Liberty quarter dollars (dated 1856 and 1858). Image used with permission from the University of Iowa Office of the State Archaeologist.

A survey of two collections of photographs from the 1860s and 1870s (Dalrymple 1991; Severa 1995) found that shirt cuffs were rarely visible beyond the coat sleeve, and that they were only intentionally displayed in portraits of men in formal dress, usually with top hats and watch chains. This finding suggests that cuff links were associated with apparel of a type too formal to be appropriate for burial, regardless of social status. Burial attire of the time is often described as "Sunday best" clothing, which was perhaps deemed appropriate because the deceased was making a final appearance in church. A roughly contemporary article on funerary etiquette states that the remains of a man "are usually 'clad in his habit as he lived' (*Harper's Bazaar* 1886)," indicating that very formal or white-tie evening wear (Colle 1972:237) would be unseemly.

However, the teenage boy in Burial 361B was clearly *not* buried in his habit as he lived. It is unlikely that a teenage boy sported formal wear on a daily basis. Furthermore, despite evidence of a formal collar and cuffs, no clothing buttons were recovered from this undisturbed grave. The presence of straight copper pins suggests that clothing without fasteners was arranged around the body, a possible example of a fourth type of burial garment rarely identified archaeologically. This so-called "sham" clothing is characterised by crude construction and long stitches, which would not have been durable if the clothing were worn by a living person, but which allowed for quick home production at the time of a death (Davidson 2016:238). Though sham clothes were based on regular sewing patterns, at least one extant example – a dress sewn during or shortly after the death of a woman in Louisiana – has no clothing fasteners at all (Welker 1999). In contrast with the back-opening, smock-style shrouds that had the appearance and fasteners of day wear, these sham burial clothes had the appearance and fit of day wear but potentially left the archaeological signature of true shrouds. In the case of Burial 361B, if the boy's collar and cuffs had been tacked on with stitches instead of mismatched accessories, there would have been no artefacts to suggest he was buried in anything other than a gown. Incongruously, despite his family's attempt at displaying his corpse in finery, and despite the high value coins included in his grave, his coffin was plain, without even coffin screws. The coffin choice was not related to availability, as the coins date his interment to 1858 or later, when coffin hardware should have been easy to obtain in Dubuque.

Only six nineteenth-century post-mortem photographs depicting teenage boys were located during this study, two from the Burns collection (Burns 1990) and four in the Thanatos Archives, a collection of early post-mortem and mourning photography in Duvall, Washington. Of these, only the previously mentioned Woodson Thompson was buried in a gown-like shroud, perhaps because a 13-year-old boy was not, at the time, considered a social adolescent (Burns 1990:Plate 64). The remaining five boys were photographed in the 1850s to 1860s and were dressed in day wear. Evidence in the pictures demonstrates that the clothes were not decorated smocks, though not enough detail is visible to determine whether or not any items were sham clothes. The sample is too small to make generalisations, but it is interesting to note that two of the boys were photographed without coats, with only shirts and vests covering their torsos (Figure 9.27; Burns 1990:Plate 34). It is unknown whether or not their coats would have been put on between photography and burial. Fifteen-year-old Pennington Wade Tucker, whose iron coffin was excavated in Louisiana, was dressed in his own under garments and day wear, and then covered with a gown-like shroud for burial (Brantley 1998). The only element missing from his Sunday best outfit was his coat, perhaps omitted because it was too bulky to fit within the shroud.

Figure 9.27. Post-mortem photograph of a teenage boy in a vest with no jacket, ca. 1855. Daguerreotype. Image reproduced with permission from The Thanatos Archive.

Burial Attire for Females

Women's clothing in the nineteenth century is difficult to reconstruct from durable artefacts alone. Dresses were constructed with fewer buttons and less variety of fasteners than men's dress suits and work outfits. A handful of fabric covered buttons might be all that remains of a once elaborate outfit. The complicated ladies' undergarments which might appear in the archaeological record would have been impractical to place on a corpse in a coffin. Evidence of corsets, hoop skirts, and bustles was not found at the Third Street Cemetery, and has rarely been identified in other American cemeteries (Peter *et al.* 2000:419). Embellishments on dresses tended to be manufactured from fabric, including ruffles, flounces, pleats, lace, fringe, braiding, bows, ribbons, decorative aprons, layered and looped skirts, attached collars, stitched-on undersleeves, and combinations of multiple materials (Dalrymple 1991; Severa 1995:95-100,194-199, 300-304). Jewellery, which appears frequently in photographs of living women of the time, was rarely deposited in the cemetery, regardless of the age of the deceased. Only two individuals were found with earrings, one adult and one young child. Only two necklaces were recovered from the graveyard, both found with infants. Of the twelve rings previously mentioned, all were plain copper-alloy bands found with adults and one adolescent, with the exception of the agate ring interred with the elderly woman in Burial 838. No bracelets or decorative hair combs were found in the cemetery, despite their popularity at the time (Severa 1995:305-306).

Brooches were also popular throughout the period, appearing in post-mortem photographs in the Thanatos Archives as well as pictures taken of the living (Dalrymple 1991; Severa 1995). Only three brooch remnants were recovered from Third Street, and in each case only the bar portion of the pin was preserved, leading to speculation that the pins may have supported hair brooches for mourning. Most surviving examples of Victorian hair mourning brooches include durable components like glass cases and metal beads, so the absence of associated materials suggests the pins were attached to ribbon-tied locks of hair or fabric dress embellishments (Davidson 2016:238; Pike and Armstrong 1980:180-183). The brooch/pin remnants were found with the two adult females in Burials 1994-2 and 111B, and on the upper left chest of the adolescent female in Burial 783.

Decorative beading was rare among the burials. A single, fragile blown glass bead was found in the vicinity of the cranium in three infant burials (360, 871, and 891) and was interpreted as a decoration on a flower wreath, based on fragments of twisted wire also present. A similar bead was found near the hand of an old adult woman buried with a wooden-bead rosary; the purpose of this glass bead is unknown. A crude bone bead found with the infant in Burial 164A was likely associated with the cross. Two very small pearlescent beads found at the centre of Burial 726 represent the only possible case of decorative beading on the clothing of an infant.

Only two other individuals were found with beads clearly related to apparel, the adolescent girls in Burials 349A and 206-1. As discussed above, the young teenager in Burial 349A was buried in a pair of shoes decorated with black blown-glass beads. The girl in Burial 206-1, who died around the age of 18 years, was found with a piece of fabric onto which 35 clear glass seed beads had been sewn in the shape of a heart (Figure 9.28). This fabric was adhered to the sternum and appeared to be part of the mass of brown wool cloth preserved over the right half of the rib cage, presumed to be the remnants of a dress (Figure 9.29). Lighter-coloured silk ribbon was also preserved, with pieces found on the neck and to the left of the mandible, and additional lengths found over the right ribs and across the waist. Two rounded sections of pleated ribbon which may have once formed a rosette were found over the left ribs (Figure 9.29). A cross-shaped arrangement of ribbons was found adhered to the viewing pane glass (Figure 9.30).

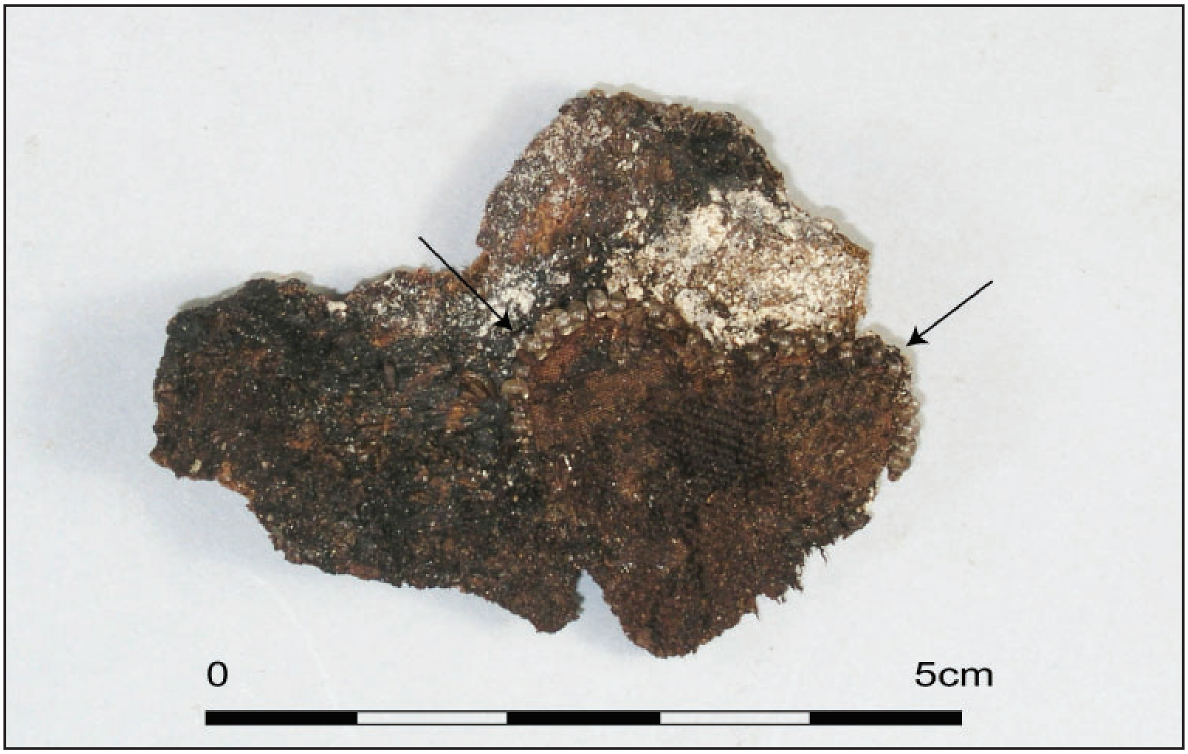

Figure 9.28. Close-up photograph of fabric embellished with glass seed beads (arrows) in the shape of a heart. Fabric found on the sternum of the adolescent female in Burial 206-1. Image used with permission from the University of Iowa Office of the State Archaeologist.

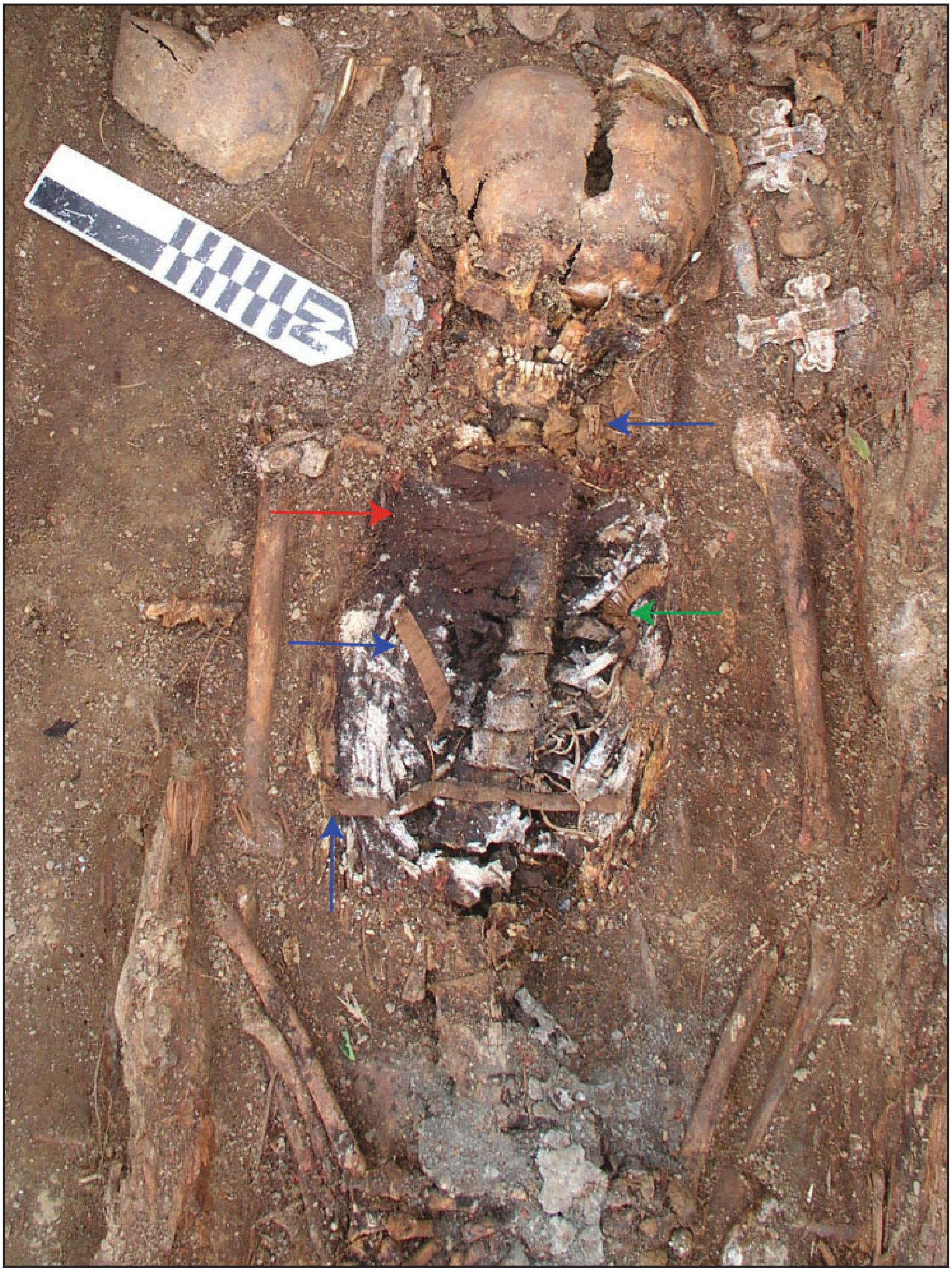

Figure 9.29. Field photograph showing the fabric preserved in Burial 206-1, including wool dress fabric (red arrow), silk ribbons (blue arrows), and a pleated silk rosette (green arrow). Image used with permission from the University of Iowa Office of the State Archaeologist.

Figure 9.30. Close-up photograph of ribbon (red arrows) adhered to the viewing pane from Burial 206-1. Image used with permission from the University of Iowa Office of the State Archaeologist.

The ribbon embellishments are presumed to be part of the young woman's dress, although, alternatively, they could have been attached to an ornate winding sheet. Though the excavator did not note their locations in the grave, the three Prosser buttons recovered with the remains are interpreted as undergarment fasteners. The single metal button found near the waist was likely associated with the dress. Despite the paucity of fasteners for the outer garment, there is no evidence that the young woman was buried in a smock-type shroud. The asymmetrical nature of the ribbon applications is consistent with the fashion of living Victorian women, but not with extant examples of ladies' shrouds (Dalrymple 1991). The beading, though not particularly intricate, makes it unlikely that she was buried in hastily-assembled sham clothing.

The apparel remnants preserved in an adult grave, Burial 868, demonstrate the tendency of women's garments to incorporate few fasteners. Pieces of a pleated red silk dress were found overlying brown wool fabric from another dress layer or undergarment. Six small Prosser buttons extending down the midline from mid-chest to the ankles and a large Prosser button found at the left wrist are presumed to be associated with the wool undergarment, as their use on the red silk outer layer would be highly unlikely, especially since one of the buttons was broken prior to deposition. The only fasteners associated with this fashionable outer layer are two large grommets on the upper chest, which may have been the metal forms supporting woven Dorset buttons. The red colour and high quality of the fabric exclude the garment from the category of smock-type shrouds, while the pleated details are too intricate for sham clothing (Davidson 2016:236-238). The conclusion is that the burial garment was day wear belonging to the woman, and thus that women's fashion in the community included dresses with few durable fasteners. The adolescent girls in Burials 783 and 914-1 may also have been wearing elaborately decorated dresses in their coffins, despite the fact that the former was found with only four shell buttons and a brooch pin, while the latter had only two Prosser buttons and a hook-and-eye set. The teenager of indeterminate sex in Burial 90 may also have been a female in such a dress, as only one Prosser button and one hook-and-eye were recovered from her grave, both in the vicinity of the neck.

A search of the Thanatos Archives located six nineteenth-century post-mortem photographs of individuals identified as teenage girls. Two of the photographs depict girls in white/light-coloured shrouds. The shroud in the later photograph (ca. 1878) is decorated with ruffles and rosettes, while the earlier one (ca. 1855) appears plain except for a small ruffled collar. The girl in a third photograph, from England ca. 1880, may also be wearing a shroud, but it is obscured by what appears to be a short, dark, back-opening mantle with fringe. No buttons are visible in these three images, but the British girl is wearing a cross pendant on a necklace. The remaining three girls are dressed in day wear. In an image from the 1860s, a girl is seated in a chair, offering a good view of her bodice and sleeves. No buttons are visible, and her belt appears to have no buckle. The only durable object is a small brooch at her neck. An image dated to circa 1868 shows a dead girl reclining on a couch wearing an outfit with a skirt, bodice, and possible chemisette of different fabrics (Figure 9.31). Only one possible button is visible, near the centre of the bow on her collar. The subject of the last photograph is a young teenager in New Hampshire. She is posed with girlish braids, but also wears large earrings and two rings. At least 10 metal buttons run down the centreline of her dress. The greater number of durable objects in this image may relate to its later date (1880s) and the location on the East Coast. For the most part, a review of post-mortem photographs of adult and adolescent females from this time period found few visible clothing fasteners.

Figure 9.31. Post-mortem photograph of a teenage girl in a skirt, bodice and chemisette, by Daniel Sewell. Sonora, California, ca. 1868. Image reproduced with permission from The Thanatos Archive.

Shrouds Versus Day Wear

Careful examination of the clothing remnants from some of the more elaborate adolescent burials revealed evidence of four types of burial garments, rather than the expected two. The distinguishing features of these four types are compared in Table 9.9.

Regardless of the differences in source, construction style, and presumed expense, the element most crucial to the discussion of mortuary display is the appearance of a burial outfit. Any garment that *looked* like a men's suit or a ladies' dress served the same purpose, manufacture type notwithstanding. When the bereaved decided between the two visual options in the attire of the deceased, they chose the message to convey to the attendees of the wake and funeral.

Table 9.9. Identifying characteristics of the four types of burial garments compared.

Garment type	Appearance	Source/Manufacture	Distinguishing characteristics	Archaeological signature
Shroud	Gown	Existing personal garment, homemade for burial, or purchased from undertaker	Nightclothes form—may be a true gown or a back-opening robe/wrapper	Straight pins and/or few light-coloured buttons
Day wear	Day wear	Personal clothes (homemade or purchased) or clothes purchased at death	Regular clothing construction—may exhibit use wear/ repairs	Mix of fastener types from various garments, jewellery/ accessories
Smock-shroud (sold as robes or wrappers)	Day wear	Purchased from undertaker	Back-opening garment with false fasteners; all elements sewn together as one piece	Same as day wear, perhaps with fewer buttons. Accessories less likely.
Sham clothing	Day wear	Homemade, sometimes from second-hand/ repurposed clothes	Hasty construction with long stitching, unfinished edges (not visible), pinking	Could be same as shroud or day wear

In her study of changing commemorative practices in Orkney, Tarlow identifies two central metaphors for death in the nineteenth century: sleep and a journey (Tarlow 1999:132-136). A study of burial clothing preserved in cast-iron coffins associates the choice of burial garments with the family's preferred metaphor (Kutruff 2012). The reason for the separation of the loved one from the living is communicated by the attire; the deceased is dressed in a gown for a long sleep or wearing an outfit appropriate for a long journey. That secular grave goods are found only with individuals dressed in day wear is appropriate, as such objects might be useful while travelling, not while sleeping.

Neither choice of outfit indicates a lack of Christian belief. The sleep was assumed to end with a reawakening in heaven or a bodily resurrection, while the destination of the journey was also heaven (Tarlow 1999:132-136). Preference in burial attire might communicate not only the ideas held by the bereaved concerning the transition to the afterlife, but also their vision of heaven itself. The "decidedly sacred shroud" (Taylor 1980:46) chosen by some families demonstrated that the deceased was done with life, beyond the need of worldly goods, and prepared to ascend to heaven already dressed as an angel (see Marino 1997 for parallel in the

Mexican tradition of *los angelitos*). However, through the later nineteenth century American popular culture presented heaven as an increasingly domesticated place, so similar to one's earthly home that inhabitants ate meals, wore outfits of their own choosing, had occupations, and even fell in love and married (Douglas 1975:63; Phelps 1868,1884). Those who subscribed to this concept of the afterlife were more likely to dress their dead, regardless of age, in everyday clothes, so that they might continue their business in heaven relatively uninterrupted. Though surviving publications concerning the domestic afterlife were penned by Protestants, both versions of heaven were apparently acceptable in this Catholic community; of the 33 coffins at Third Street with viewing portals (hinges or glass panes), 17 displayed shrouded individuals while 16 exhibited people in day wear.

The idea of a smooth transition from life to a similar afterlife would particularly appeal to parents of dead adolescents, supplanting their frustration at seeing a child founder on the verge of maturity and providing a vision of their offspring continuing the path to adulthood, enjoying the milestones they were denied on earth. Aspirational status expressed through mortuary display, as described by Cannon (1989), is used in this case to demonstrate future identity in heaven's society, rather than to elevate past living status, as in the case of adult funerals. In this context, it makes sense for the family to outfit the girl in Burial 349A as a little adult and put her in a grown-up coffin, or to dress the boy in Burial 361B in finery beyond the family's means and provide him a large sum for entry into the afterlife. Additionally, the decision of how to dress and display the adolescent dead may have sometimes hinged on family dynamics or the personalities of the teenagers themselves. John Joseph Blake travelled to the afterlife dressed as if he were returning to college after a break, while his sister Ellen wore a shroud without so much as a pin. As Ellen was only the second of six sisters to die, while John Joseph was the fourth and last male heir lost, the parents may have accepted Ellen's transition to heaven more easily than the departure of their final hope.

9.5. Summary: Preparing the Adolescent Dead at Third Street

Comparisons of separate burial attributes found few significant differences between adolescents and the other segments of the population from the Third Street Cemetery. For all age groups, plain coffins were the most common type, and evidence of burial in a shroud was found in the majority of graves. Secular or personal grave goods were rarely included in graves, and though a higher percentage of teenagers' burials included these items, the numbers are too small to indicate an adolescent-specific trend. Religious items were recovered from around 20% of all graves, but age was not a related variable. Instead, analysis found a that higher levels of mortuary display were associated with greater frequency of religious objects.

When combinations of burial attributes were divided into six burial types, statistically significant differences between age classes were observed. Infants were more likely to be interred in Type 1, 3, and 5 burials, as they were usually buried in shrouds. Adults were more likely to be placed in Type 2 burials, with plain coffins but evidence of day wear. Adolescents were interred more often in Type 6 burials, the grave features exhibiting the highest level of mortuary display. This finding confirms the hypothesis that adolescents in the Third Street Cemetery were subject to differential mortuary treatment. The more frequent inclusion of personal objects and the use of apparel-related items not seen in the graves of adults and children suggest that some of the adolescent interments deviated slightly from the standard format established in this Midwestern Catholic community.

"The purpose of classifying mortuary data is to isolate clusters of burials, which can be interpreted as socially distinctive (Tainter 1978:117)." That this study identified no unique archaeological signature for adolescent burials at Third Street is indicative of the fact that living adolescents were not particularly socially distinctive. These teenagers were simply Dubuquers in transition, with many of the responsibilities and few of the rights of full community members. Nevertheless, individuals on the threshold between childhood and adulthood were frequently buried with the trappings of socially important adults, a mortuary choice that allowed parents to envision their teenagers reaching full maturity in a domesticated version of heaven.

In nineteenth- and twentieth-century America, mortuary decisions were made within the framework of what was available, what was culturally appropriate, and what was financially feasible (Farrell 1980). The very poor, and others who had to depend on charitable societies, likely had little choice when it came to funeral arrangements, and ended up in Type 1 burials, along with individuals who selected that interment style for personal reasons. Type 6 burials could involve massive outlays of money, but they were not reserved for the wealthy elite. In fact, very little expenditure was required to leave the archaeological signature of a Type 6 burial. Interment in one's own day wear clothing costs nothing, and a few cheap coffin decorations could be purchased for pennies and added to a homemade burial container. The intent of the display and the dressing of the corpse for a journey are the distinguishing characteristics of a Type 6 burial, rather than the overall cost. The differences between the burials of John Joseph and Ellen Blake at Third Street illustrate the complexity of mortuary decision-making, which can be affected by temporal aspects, personal dynamics, and the circumstances of death. Without the identification of the siblings and without knowledge of the family history, archaeologists might simply assume that the male had a wealthy family and the female a poor one.

Though little information can be gleaned from the shrouded adolescents in Type 1 and 3 burials, the remainder of the interment types demonstrate the desire of the principal mourners to express themselves through mortuary display. According to evolutionary psychology, parental grief is greatest over the death of an adolescent, whose loss represents the failure of a major investment of time and assets, as well as the loss of reproductive capability (Wright 1994:174-176). Letters and diaries from the Victorian period evidence this proportionally greater grief, though they also demonstrate that high infant mortality does not create a callous attitude towards infant deaths (Jalland 1996:119-142). That one Victorian father wrote a 34-page account of his 17-year-old son's death from tubercular meningitis and another built a brick burial vault for a 17-year-old son whose suicide might have prevented his interment in the cemetery grounds illustrates the level of sentiment that could be expressed at the death of a teenager during this period (Jalland 1996:72-74, 139).

The post-mortem photograph of a young woman (ca. 1870) who may have been a teenager bears a handwritten note that reads, "Daughter whose above photo was taken 9 days after death. Mother could not part with only daughter" (Burns 1990:Plate 56). This reluctance to let go of adolescents is sometimes reflected in the dressing of the dead as adults, and, in at least one case at Third Street, a long interval before burial. The teenage girl in Burial 206-1, who was laid out in a red coffin and adorned with beads and ribbons, with scissors by her side, was apparently kept above ground for longer than the usual one to two days before interment (Mack 2013c:78). Pupa casings, which were not encountered in any other burial at Third Street, were found throughout the preserved fabric and among her teeth, an indication that maggots hatched, grew, and entered the pupal stage, perhaps before the girl was even buried.

Chapter 10

Mortuary Treatment Patterns in Other Nineteenth-Century American Cemeteries

10.1. Introduction

Individual adolescent burials in the Third Street Cemetery did not bear a unique archaeological signature. However, the tendency for adolescents to be buried with a high level of mortuary display (Type 6 burials), a greater frequency of personal grave goods, and items indicating greater than average ornamentation of burial clothing identified them as a group distinct from other age classes within the cemetery. To determine whether or not this preferential mortuary treatment existed in other communities in the United States, burial attribute data was collected from nine contemporary cemeteries in a search for similar patterns observable in both individual attributes and groups of attributes (Burial Types). Table 10.1 lists the comparative cemeteries, their locations, and dates of use, as well as the number of intact (or mostly intact) grave features observable for burial attributes, divided by age class.[1] The final column gives the percentage of intact interments containing adolescent remains. Please refer to Chapter 5 of this volume for detailed descriptions of the cemeteries and their excavations. Note that data from the Campo Santo of San Fernando was not available, as the excavation was halted due to legal proceedings. Mortuary treatment information for the remaining burial grounds was gathered from published reports listed in the reference column of Table 10.1, supplemented in the cases of Wells and Freedman Cemeteries with data provided by the original researchers, Larry McKee and James Davidson, respectively. The author also had the opportunity to examine artefacts from the adolescent graves at Grafton Cemetery.

1 Available data from Freedman Cemetery did not include information about the level of disturbance to individual graves. All burial features included in previous studies of mortuary treatment (Davidson 1999, 2004a; Peter *et al.* 2000) were included in the current study.

Table 10.1. List of excavated cemeteries used for comparative data regarding mortuary treatment, with locations and date ranges included. The number of interments observable for burial attributes (Feature Integrity Code 1 or 2) is given, divided by age class. The percentage of observable interments containing adolescent individuals is given in the last column.

Cemetery	Location	Active Period	Reference	# of Infants	# of Children	# of Adolescents	# of Adults	TOTAL #	Adolescent pop. %
Second Catholic Graveyard	St. Louis, Missouri	1824-1850s	Harl *et al.* 1996	23	7	3	44	77	3.9
Voegtly Cemetery	Pittsburgh, Pennsylvania	1833-1861	Beynon 1989a, b; Ubelaker and Jones 2003	403	81	18	157	659	2.7
Grafton Cemetery	Grafton, Illinois	1834-1873	Buikstra *et al.* 2000 and unpublished data	86	40	18	100	244	7.4
Wells Cemetery	Ooltewah, Tennessee	1838-1876	McKee 2012 and unpublished data	125	58	13	158	354	3.7
Alameda-Stone Cemetery	Tucson, Arizona	1860s-1875	Heilen and Gray 2010a, b; Heilen *et al.* 2010	381	88	36	415	920	3.9
Freedman Cemetery	Dallas, Texas	1869-1907	Davidson 1999, 2004; Peter *et al.* 2000; unpublished data	415	53	56	601	1125	5
Avondale Burial Place	Bibb County, Georgia	1869-1935	Matternes *et al.* 2012a, b	40	20	3	36	99	3
Dove Cemetery	Atascadero, California	1870s-1890s	Sewell and Stanton 2008	3	1	1	12	17	5.9
Milwaukee County Poor Farm Cemetery	Wauwatosa, Wisconsin	1882-1925	Richards *et al.* 2016	256	2	12	318	588	2
TOTAL:				1732	350	160	1841	4083	3.9

10.2. Burial Containers and Coffin Decoration

As with the Third Street Cemetery burials, coffins in the comparative cemetery datasets were divided into three types. Burial containers constructed with only utilitarian hardware were placed in the plain coffin category, while coffins decorated with only white metal coffin screws were designated “simple.” Elaborate coffins include one or more decorative hardware elements (see Chapter 2, Section 2.2.4 for list). Precise quantities of various coffin ornaments (or clothing fasteners, for that matter) were not provided in all of the cemetery excavation reports, but the presence of specific types was always noted. The chief difference observed in this new dataset is the absence of coffins in one of the burial grounds. Over 10% (117/920) of the individuals interred in the Alameda-Stone Cemetery were placed directly in the ground with no burial container. These uncoffined burials were included in the count of plain coffins, as they demonstrate the same decision not to place the deceased in a decorated container. The number and percentage of individuals of each age class buried in each coffin type is found in Table 10.2.

In four cemeteries – Voegtly, Grafton, Avondale, and Dove – adolescents appear to have been buried in elaborate coffins with greater frequency than individuals of other age classes. However, in each of these cases, the sample size is too small for reliable statistics, as expected values are <5. In contrast, individuals of all ages in Freedman Cemetery were equally likely to be interred in elaborate coffins (83-93% of each age group). Though coffin decoration was less common in Wells Cemetery, it was also relatively evenly distributed, with between 12% and 20% of individuals in each age class buried in an elaborate coffin. When all of the comparative samples are pooled, the distribution of coffin types among adolescents mirrors that of adults, with around half being buried in elaborately decorated burial containers, while only one-quarter of infants and children had decorative coffins.

Table 10.2. Number and percentage of individuals from the nine comparative cemeteries interred in each coffin type, divided by age class. Cemeteries are arranged chronologically, oldest to most recent. Yellow highlighting denotes cells which appear to demonstrate a higher or lower frequency of adolescents with elaborate coffins within a cemetery population. For the Alameda-Stone Cemetery, plain coffin counts include individuals interred without a burial container.

Age Class	# of burials	# of plain coffins	% plain	# of simple coffins	% simple	# of elaborate coffins	% elaborate
Second Catholic Graveyard, St. Louis, Missouri, 1824-1850s							
Infant	23	23	100.0	0	0.0	0	0.0
Child	7	7	100.0	0	0.0	0	0.0
Adolescent	*3*	*3*	*100.0*	*0*	*0.0*	*0*	*0.0*
Adult	44	44	100.0	0	0.0	0	0.0
Total:	77	77	100.0	0	0.0	0	0.0
Voegtly Cemetery, Pittsburgh, Pennsylvania, 1833-1861							
Infant	403	319	79.1	47	11.7	37	9.2
Child	81	57	70.4	14	17.3	10	12.3
Adolescent	*18*	*13*	*72.2*	*1*	*5.6*	*4*	*22.2*
Adult	157	129	82.2	17	10.8	11	7.0
Total:	659	518	78.6	79	12.0	62	9.4
Grafton Cemetery, Grafton, Illinois, 1834-1873							
Infant	86	46	53.5	17	19.8	23	26.7
Child	40	21	52.5	8	20.0	11	27.5
Adolescent	*18*	*8*	*44.4*	*1*	*5.6*	*9*	*50.0*
Adult	100	47	47.0	19	19.0	34	34.0
Total:	244	122	50.0	45	18.4	77	31.6
Wells Cemetery, Ooltewah, Tennessee, 1838-1876							
Infant	125	81	64.8	28	22.4	16	12.8
Child	58	33	56.9	15	25.9	10	17.2
Adolescent	*13*	*6*	*46.2*	*5*	*38.4*	*2*	*15.4*
Adult	158	88	55.7	39	24.7	31	19.6
Total:	354	208	58.8	87	24.6	59	16.6
Alameda-Stone Cemetery, Tucson, Arizona, 1860s-1875*							
Infant	381	366	96.1	7	1.8	8	2.1
Child	88	85	96.6	1	1.1	2	2.3
Adolescent	*36*	*36*	*100.0*	*0*	*0.0*	*0*	*0.0*
Adult	415	388	93.5	12	2.9	15	3.6
Total:	920	875	95.1	20	2.2	25	2.7

*"Plain coffins" category includes individuals buried without a coffin at Alameda-Stone.

Table 10.2., continued.

Age Class	# of burials	# of plain coffins	% plain	# of simple coffins	% simple	# of elaborate coffins	% elaborate
Freedman Cemetery, Dallas, Texas, 1869-1907							
Infant	415	69	16.6	0	0.0	346	83.4
Child	53	4	7.5	0	0.0	49	92.5
Adolescent	*56*	*9*	*16.1*	*0*	*0.0*	*47*	*83.9*
Adult	601	75	12.5	0	0.0	526	87.5
Total:	1125	157	14.0	0	0.0	968	86.0
Avondale Burial Place, Bibb County, Georgia, 1869-1935							
Infant	40	39	97.5	0	0.0	1	2.5
Child	20	12	60.0	0	0.0	8	40.0
Adolescent	*3*	*1*	*33.3*	*0*	*0.0*	*2*	*66.7*
Adult	36	24	66.7	0	0.0	12	33.3
Total:	99	76	76.8	0	0.0	23	23.2
Dove Cemetery, Atascadero, California, 1870s-1890s							
Infant	3	2	66.7	0	0.0	1	33.3
Child	1	1	100.0	0	0.0	0	0.0
Adolescent	*1*	*0*	*0.0*	*0*	*0.0*	*1*	*100.0*
Adult	12	3	25.0	1	8.3	8	66.7
Total:	17	6	35.3	1	5.9	10	58.8
Milwaukee County Poor Farm Cemetery, Wauwatosa, Wisconsin, 1882-1925							
Infant	256	251	98.0	0	0.0	5	2.0
Child	2	0	0.0	0	0.0	2	100.0
Adolescent	*12*	*4*	*33.3*	*0*	*0.0*	*8*	*66.7*
Adult	318	31	9.7	0	0.0	287	90.3
Total:	588	286	48.6	0	0.0	302	51.4
Totals (Pooled sample)							
Infant	1732	1196	69.1	99	5.7	437	25.2
Child	350	220	62.8	38	10.9	92	26.3
Adolescent	*160*	*80*	*50.0*	*7*	*4.4*	*73*	*45.6*
Adult	1841	829	45.0	88	4.8	924	50.2
Total:	4083	2325	56.9	232	5.7	1526	37.4

Adolescents in three of the burial grounds – Second Catholic Graveyard, Alameda-Stone, and the MCPFC – were *not* buried in elaborately decorated coffins with equal or greater frequency than other age classes. Of these, one population can be eliminated from the comparison. All interments at the Second Catholic Graveyard in St. Louis were found to have plain coffins, likely because the cemetery's active use period (1824-1850s) predated the availability of mass-produced coffin hardware. Though artisan-made and imported coffin handles were available in the U.S. by the late eighteenth century, commercially made items were not in common distribution until the mid-nineteenth century, with the earliest known appearance of coffin screws in a hardware catalogue dating to 1853 (Mainfort and Davidson 2006:122-146). Of course, the lack of decorative hardware does not indicate necessarily that the burial containers were not ornamented in some fashion. More than half of the Second Catholic Graveyard coffins were constructed with peaked lids designed to display a pall at the funeral, though this practice had largely gone out of fashion by the 1800s. Additionally, 12 coffins still bore traces of red paint (Harl *et al.* 1996:74, 82). Unfortunately, as coffin decorations of a perishable nature cannot be consistently observed, they were not included in this study.

Preservation of non-hardware coffin decoration was particularly prevalent in the Alameda-Stone burial sample, where paint or fabric survived on 10% of the undisturbed coffin exteriors (94/920). Green, blue, and yellow were the most commonly observed colours, and paint was often observed on coffin interiors as well as exteriors. One infant coffin had the remnants of a floral or leaf pattern painted on the lid. Evidence of floral arrangements – both natural and artificial – was also commonly found in coffins, including twisted florist's wire, beads, glass and ceramic flower buds, and painted newspaper fragments (Heilen *et al.* 2010:217-218). Though flower wreaths placed on the heads of deceased children represent canonical Catholic funeral rites, additional flower arrangements can be considered merely decorative objects and elements of mortuary elaboration. However, since consistent preservation of floral elements, which were often composed of fresh flowers only, cannot be expected, these arrangements were not included in the evaluation of coffin decoration either.

Though the prevalence of perishable coffin decorations at Alameda-Stone might be due, in part, to mourner preference, it is also likely related to the lack of available coffin hardware. Though this cemetery was founded in the 1860s, when the mass-production and national distribution of decorative coffin hardware was well underway (Springate 2015:57-63), its location on the Southwest frontier prevented the materials from reaching the outpost in large quantities. All nonlocal commodities had to travel enormous distances to reach the community. Some goods were carried over land the 1,500 miles to Tucson from Mexico City. Others were brought by pack animals or wagon trains from Missouri or from ports in Texas or California. Wagon freighting across the desert was expensive, and trips were frequently interrupted by Apache raids, accidents, and livestock losses (Heilen and Gray 2010a:118). As railroad networks did not reach Tucson until 1880, after the cemetery fell out of use, the lack of coffin hardware in the non-military graves is not surprising (Heilen and Gray 2010a:12). Out of 920 relatively intact burials included in the study sample from Alameda-Stone, just 45 coffins had any kind of decorative hardware, less than 5%.

Of the remaining burials, 82.4% (758/920) had plain coffins and 12.7% (117/920) had no burial container at all. Two explanations are provided by the original excavation report for the absence of coffins in some graves. In the nineteenth-century Hispanic Catholic community, rejection of a burial container, even a plain one, was perceived as an act of piety or a conspicuous expression of humility. As coffins had only recently become common in the region, burial without one was probably not a noteworthy event (Heilen and Gray 2010a:219). On a more practical note, wood was considerably scarcer in this desert community than, for instance, in the timber-rich Dubuque area. Riparian areas along the Santa Cruz River and its tributaries provided the only local sources of material in Tucson. Limited access to wood due to availability and cost was likely a factor in funeral decision-making (Heilen *et al.* 2010:82-83, 221-222).

In contrast with many of the other cemetery samples, elaborately decorated coffins were never used for adolescent interments at Alameda-Stone. Of the 36 adolescent burials, 22 teenagers were buried in plain coffins and 14 were buried directly in the ground. Furthermore, a higher proportion of adolescents had uncoffined burials than any other age group, as can be seen in Table 10.3. Pearson’s chi-square could not be used to compare all age classes, as some expected counts are <5. A comparison of only adults and adolescents found that teenagers were significantly more likely to be buried without a coffin ($\chi^2=7.001$, df=1, $p=0.008$). This variation from the national pattern will be examined further in Section 10.8.4.

Table 10.3. Number and percentage of individuals buried without coffins in the Alameda-Stone Cemetery, divided by age class.

Age Class	# of burials	# w/o coffin	% w/o coffin
Infant	381	14	3.7
Child	88	6	6.8
Adolescent	36	14	38.9
Adult	415	83	20.0
Total:	920	117	12.7

The third sample which exhibits a deviating pattern comes from the Milwaukee County Poor Farm Cemetery (MCPFC). As seen in Table 10.2, adolescents appear less likely to be interred in decorated coffins than children and adults, though they have a much higher frequency of burial in such coffins than infants do. This pattern is explained by a closer examination of burial practices in the county grounds. As described in Chapter 5, the cemetery was used from 1882 to 1925 for the interment of individuals who died in the Milwaukee County Institutions – the Poor Farm, isolation hospital, Asylum for the Chronically Insane, and the Home for Dependent Children – as well as unidentified individuals from the coroner's office and Milwaukee County residents unable to afford private burial. Mortuary treatment at the expense of the county was designed to provide the bare minimum required for a "decent Christian burial," while at the same time discouraging people from utilising this service (Richards 1997:11). The county contracted with craftsmen and undertakers who submitted the lowest bids for the provision of coffins until the turn of the twentieth century, when inmates of the county institutions took over coffin construction. Regardless of the provider, the cheapest materials were consistently used (Richards 1997:143). The vast majority of the coffin handles recovered during both the project in the 1990s and the 2013 excavation that provided the study sample were utilitarian handles of iron or steel with a japanned (black enamel) finish. These were sold as chest or shipping box handles and were neither decorative nor mortuary-specific hardware (Richards 1997:161-191; Richards *et al.* 2016:152-158). The frequency of handles increases with the age/size of the deceased (Richards *et al.* 2016:152), which indicates that handles were purely functional, included on coffins only to make them easier to carry around the large cemetery. Only 18 coffins had decorative coffin handles, all in adult burials. Apparent clustering of some burials with these handles suggests short-term use – perhaps of an out-dated design – by a particular coffin provider. Other examples of ornamental hardware were nearly non-existent in the cemetery, including just four interments with undecorated iron thumbscrews. The single infant-sized cast iron casket clearly represents burial under unusual circumstances.

Though data from six of the burial grounds examined in this comparison demonstrate that in the second half of the nineteenth century and the early twentieth century, adolescents were equally likely or more likely to be buried in elaborately decorated coffins than older and younger members of the same communities, the results also high-light temporal and regional differences. For instance, excavation of Freedman Cemetery, which was used into the 1900s, revealed community preferences at the height of Victorian mortuary elaboration, with 85% (968/1,125) of all interments in highly decorated coffins. The assemblage from this urban African-American cemetery is considerably richer than that of the Avondale Burial Place, a rural African-American graveyard active during the same period with elaborately decorated coffins in only 23% (23/99) of all excavated graves (66.7%, 2/3 adolescent graves). Variations due to hardware availability and cultural preferences are discussed in Section 10.8 below.

10.3. Burial Attire

As with the Third Street Cemetery sample, burial attire for the nine comparative cemeteries was classified into two categories, shrouds/gowns and day wear. The presence of a shroud/gown was inferred from a total absence of clothing fasteners, the presence of only copper straight pins, or the recovery of only a single type of light-coloured button. In the assemblage from the MCPFC, which represents the latest period included in this study, the presence of a single metal snap is also interpreted to represent burial in a gown, as this type of fastener – patented in 1885 – was an inexpensive and easy-to-close button substitute that might have been used on patient/inmate clothing (Flinn and Patel 2016:86).[2] However, if multiple button types were found, or a combination of buttons with other clothing fasteners, it was assumed that the individual was buried in an outfit composed of multiple garments, consistent with day wear. Day wear was also evidenced by the presence of metal buttons, decorative buttons, or ornamental accents such as beading, accessories, or jewellery (excepting plain rings). The results of the burial attire analysis are presented in Table 10.4, with the number and percentage of individuals of each age class buried in each outfit type given.

In five cemetery samples – Voegtly, Freedman, Avondale, Dove, and the MCPFC – adolescents appear to have been buried wearing day-wear outfits with greater frequency than individuals of other age classes. However, in most cases, the difference between adolescent and adult rates is not great, and the sample sizes are too small for reliable statistical analysis. In the Grafton, Wells, and Alameda-Stone samples, adolescents were found buried in day-wear outfits with the same frequency as adults, and considerably greater frequency than infants. Again, the Second Catholic Graveyard proved an exception to the pattern; all three adolescents were buried in shrouds. The lack of day wear for adolescents seems unrelated to the early date of the cemetery, as the 13 adults and one child buried in complex outfits attest to the mortuary trend having reached St. Louis. The lack of variation in adolescent burial attire may be due to the exceedingly small sample.

Pooled numbers from all nine cemetery samples (see "Total" in Table 10.4) were subjected to chi-square analysis. Results from the first test of independence demonstrated that the inclusion of infants, who were rarely buried in day-wear outfits, confounded the outcome. When the chi-square test was performed on the pooled numbers excluding infants, adolescents were found to be significantly more likely to be buried in day wear ($\chi^2=25.801$, df=2, $p=0.000$).

2 Richards (1997) interpreted snaps recovered from the 1990s excavation as evidence of outside clothing, i.e. burial of an individual who did not reside in one of the county institutions. During the current study, snaps that were found in conjunction with other clothing fasteners were classified as elements of day wear. When found alone, snaps were considered to represent gowns, institutional or otherwise.

Table 10.4. Number and percentage of individuals from the nine comparative cemeteries interred in each type of burial attire, divided by age class. Cemeteries are arranged chronologically, oldest to most recent. Yellow highlighting denotes cells which appear to demonstrate a higher or lower frequency of adolescents buried in complex day-wear outfits within a cemetery population.

Age Class	# of burials	# with shrouds	% with shrouds	# with day wear	% with day wear
Second Catholic Graveyard, St. Louis, Missouri, 1824-1850s					
Infant	23	23	100.0	0	0.0
Child	7	6	85.7	1	14.3
Adolescent	*3*	*3*	*100.0*	*0*	*0.0*
Adult	44	31	70.5	13	29.5
Total:	77	63	81.8	14	18.2
Voegtly Cemetery, Pittsburgh, Pennsylvania, 1833-1861					
Infant	403	382	94.8	21	5.2
Child	81	73	90.1	8	9.9
Adolescent	*18*	*13*	*72.2*	*5*	*27.8*
Adult	157	128	81.5	29	18.5
Total:	659	596	90.4	63	9.6
Grafton Cemetery, Grafton, Illinois, 1834-1873					
Infant	86	83	96.5	3	3.5
Child	40	36	90.0	4	10.0
Adolescent	*18*	*12*	*66.6*	*6*	*33.3*
Adult	100	67	67.0	33	33.0
Total:	244	198	81.1	46	18.9
Wells Cemetery, Ooltewah, Tennessee, 1838-1876					
Infant	125	118	94.4	7	5.6
Child	58	50	86.2	8	13.8
Adolescent	*13*	*8*	*61.5*	*5*	*38.5*
Adult	158	108	68.4	50	31.6
Total:	354	284	80.2	70	19.8
Alameda-Stone Cemetery, Tucson, Arizona, 1860s-1875					
Infant	381	237	62.2	144	37.8
Child	88	17	19.3	71	80.7
Adolescent	*36*	*7*	*19.4*	*29*	*80.6*
Adult	415	78	18.8	337	81.2
Total:	920	339	36.8	581	63.2
Freedman Cemetery, Dallas, Texas, 1869-1907					
Infant	415	335	80.7	80	19.3
Child	53	25	47.2	28	52.8
Adolescent	*56*	*15*	*26.8*	*41*	*73.2*
Adult	601	233	38.8	368	61.2
Total:	1125	608	54.0	517	46.0

Table 10.4., continued.

Age Class	# of burials	# with shrouds	% with shrouds	# with day wear	% with day wear
Avondale Burial Place, Bibb County, Georgia, 1869-1935					
Infant	40	34	85.0	6	15.0
Child	20	15	75.0	5	25.0
Adolescent	*3*	*0*	*0.0*	*3*	*100.0*
Adult	36	14	38.9	22	61.1
Total:	99	63	63.6	36	36.4
Dove Cemetery, Atascadero, California, 1870s-1890s					
Infant	3	2	66.7	1	33.3
Child	1	1	100.0	0	0.0
Adolescent	*1*	*0*	*0.0*	*1*	*100.0*
Adult	12	2	16.7	10	83.3
Total:	17	5	29.4	12	70.6
Milwaukee County Poor Farm Cemetery, Wauwatosa, Wisconsin, 1882-1925					
Infant	256	246	96.1	10	3.9
Child	2	1	50.0	1	50.0
Adolescent	*12*	*9*	*75.0*	*3*	*25.0*
Adult	318	295	92.8	23	7.2
Total:	588	551	93.7	37	6.3
Totals (Pooled sample)					
Infant	1732	1460	84.3	272	15.7
Child	350	224	64.0	126	36.0
Adolescent	*160*	*67*	*41.9*	*93*	*58.1*
Adult	1841	956	51.9	885	48.1
Total:	4083	2707	66.3	1376	33.7

10.3.1. ADOLESCENT BURIAL OUTFITS

As illustrated by the Third Street Cemetery sample, remnants of adolescent burial attire suggest that some teenagers went to the grave "dressed up" to a greater extent than other individuals within the same cemetery. Out of Voegtly Cemetery's five teenagers buried in day wear, one has the highest number of metal buttons observed in the cemetery (20), and three were wearing clothing with decorated Prosser buttons, including flower-print, piecrust, and hobnail varieties. The fifth adolescent, a 17- to 22-year-old female, was interred wearing more personal ornaments than any other individual in the burial ground. Her accessories included the only brooch, only bracelet, and one of only two rings found in the cemetery, in addition to earrings and a hairpin. In Grafton Cemetery, four adolescents were interred with decorative buttons. Button types are generally more varied in the Grafton sample than in the Third Street collection or the earlier burial grounds in this study, but it is worth noting that the ornamental buttons in three of the teen graves were unique, including metal buttons set with clear glass "gems," faceted black glass buttons, and a white glass starburst button (Figure 10.1). In his study of post-mortem photography, Aldridge (2008:96) notes the adoption of new styles by younger generations, which would be visible in the grave when individuals were buried in their own clothing or if the deceased's preferences were taken into account when choosing burial attire. This propensity for new fashions and fads might explain the presence of unusual or unique clothing fasteners and accessories in adolescent graves.

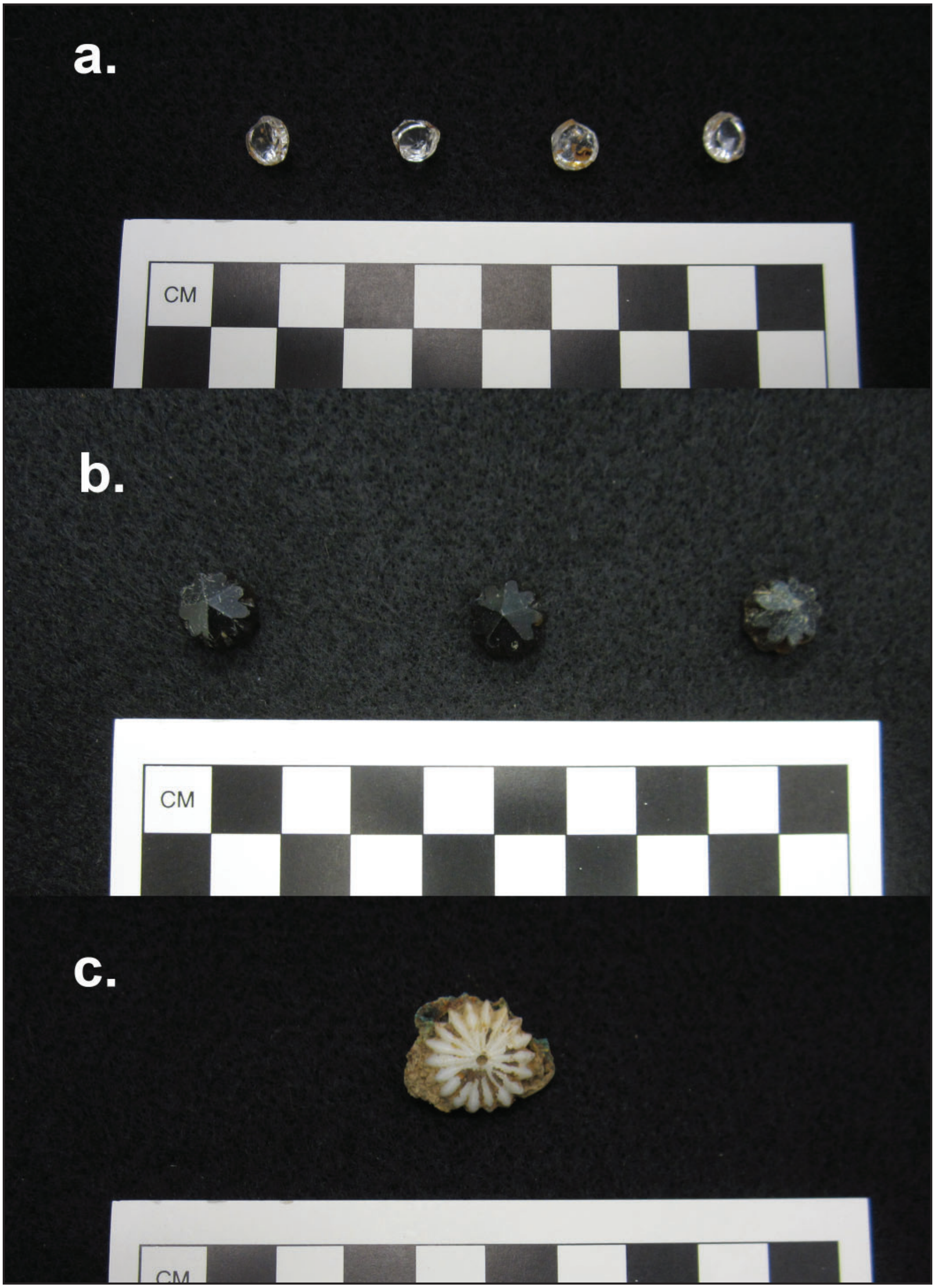

Figure 10.1. Decorative buttons recovered from adolescent graves in Grafton Cemetery; a. glass "gems" from metal buttons (not preserved) in Burial 11, b. faceted black glass buttons from Burial 33, and c. opaque glass button from Burial 160. Photograph used with the permission of the Illinois State Museum.

Though jewellery was much more common at Protestant Wells Cemetery than, for instance, the Third Street Cemetery, only five individuals interred at Wells were buried wearing necklaces. Three of the necklaces were simple strings of glass beads, found in one adult's and two children's graves. Two older adolescent females, however, were interred with unique jewellery. The young woman in Burial 326 wore a chain necklace with a blue-enamelled locket, a brass and blue glass brooch, and two brass rings. The young woman in Burial 353, who may have had some Native American ancestry, was interred with a necklace or collar composed of a large clear glass flower-shaped button, two opaque turquoise buttons, one round apple-green glass bead, four black doughnut-shaped glass beads, three spherical white glass or porcelain beads, two light-blue glass tube beads, and around 80 black glass seed beads. Only a single Prosser button was found in a location related to garment fastening, indicating that she – like the three adult women with jewellery but no buttons at all – may have been buried in "sham" clothing.

Evidence of elaborate beading – of a necklace or dress neckline – was also discovered in the grave of a 16- to 19-year old female buried in the Alameda-Stone Cemetery. Skeletally identified as Native American, this young woman was found with 2,380 seed beads, a copper brooch, and five copper buttons set with amber glass rosettes, which had preserved some red garment fabric. Though unusual, this level of personal ornamentation was not unique within the cemetery; three adult females and an infant were also found with hundreds or thousands of beads. Two of the women were also identified as Native American (Hall *et al.* 2010). Brooches were found in two other adolescent graves, bringing the number of teenagers buried with brooches to three, out of seven individuals in the cemetery. Two out of nine individuals buried with rings were adolescents, while the remainder were adults.

Given that the U.S. Army used a portion of Alameda-Stone Cemetery (1862-1881), the presence of brass military buttons is not surprising. However, the occurrence of these buttons outside the walled military section and in the graves of individuals too young to enlist is interesting. A 12- to 13-year-old was found with nine U.S. Artillery coat buttons on the torso. A 15- to 19-year-old male found with two General Service uniform buttons on his torso may have been old enough to enlist but does not appear to have been buried in a uniform, as those two buttons were the only clothing artefacts present. Likewise, an 18- to 20-year-old male with four military buttons found near the lower left leg was clearly not buried in an actual uniform. It is tempting to associate the second-hand use of military garments or buttons with aspirational dressing of the adolescent dead by parents who had hoped to see their children become young men. However, the presence of these military buttons in two infant graves as well suggests that the local population may have simply found the buttons attractive and re-used them on various types of garments.[3]

In the remaining four cemetery populations, no evidence for preferential dressing of the adolescent dead was identified. The urban African-American community that utilised Freedman Cemetery in Dallas sent nearly all of their dead to the grave "dressed to the nines." Therefore, the large number of teenage girls found with jewellery and teenage boys found with cufflinks and various shirt studs is not significant.[4] No such accessories were found with the adolescents interred at the poorer, rural, African-American Avondale Burial Place, though all teenagers there were buried in day wear and one had faceted glass buttons. Given the variety of buttons recovered from graves of all ages at Dove Cemetery, the painted wooden buttons recovered from the adolescent burial, while unique, are not significant.

Not surprisingly, no ornamental clothing fasteners were found with the adolescents buried in the MCPFC, though one 15- to 16-year old was buried with sock garters, a singular find. In her first study of the MCPFC, Richards (1997) interpreted graves with clothing fasteners of any kind as representing two types of individuals, those whose families could not afford burial (her Category III) or those whose unidentified/unclaimed bodies were sent from the Milwaukee County Coroner's office (Category II). The presence of utilitarian objects in some of the Category II graves – combs, pencils, tools, coins, bottles, etc. – is taken as evidence that individuals sent by the coroner were buried with the clothing and personal items they had at the time of

3 Civilian use of military surplus clothing is well-documented in areas with a strong U.S. military presence such as the Philippines (Congressional Record 1950:A982).

4 Though not all of the graves in Freedman Cemetery can be dated, it should be noted that most of the burials containing trouser braces, earrings, bracelets, or decorative or unusual buttons, button sets, buckles, pins, and cuff and collar closures, date to the Late Period (1900-1907) of the burial ground's use (Peter *et al.* 2000:409-423, 430, 435-7), which falls outside the primary study period. Changing fashions and greater availability of mass-produced clothing and clothing hardware resulted in burial attire choices that were not feasible in the nineteenth century.

death. The teenager with sock garters is a good candidate for this type of burial, since garters are unnecessary when the person being dressed will remain horizontal and still.

These circumstances are not unique to institutional graveyards. When interpreting clothing evidence in any cemetery, one should bear in mind that the archaeological signature for an individual buried in his or her “Sunday best” might not appear markedly different from that of an individual buried in the clothes in which he or she died. Thus, analysis that takes into account both coffin decoration and burial attire provides a clearer picture of the principal mourners’ intentions than an examination of either attribute by itself. However, before the distribution of burial types in the comparative sample is discussed, the presence of less common types of grave goods – personal items and religious objects – should be addressed.

10.4. Secular Grave Goods

Though some non-Catholic cemeteries included in this study demonstrated slightly higher rates of burial with secular or personal items, the overall numbers were quite low, with only 4.4% of graves (178/4,083) found to contain such items (Table 10.5). The pattern seen in the Third Street Cemetery, where a larger proportion of adolescents were buried with secular grave goods than other age classes, was repeated only in Voegtly Cemetery and in the MCPFC. In Freedman Cemetery, adolescents had a higher percentage of these items than adults did, but not as high as the child age group. In the remaining six burial grounds, personal items were not found in any of the adolescent graves.

Table 10.5. Number and percentage of individuals from the nine comparative cemeteries interred with secular/personal grave goods, divided by age class. Cemeteries are arranged chronologically, oldest to most recent.

Age Class	# of burials	# with secular grave goods	% with secular grave goods
Second Catholic Graveyard, St. Louis, Missouri, 1824-1850s			
Infant	23	0	0.0
Child	7	0	0.0
Adolescent	*3*	*0*	*0.0*
Adult	44	1	2.3
Total:	77	1	1.3
Voegtly Cemetery, Pittsburgh, Pennsylvania, 1833-1861			
Infant	403	8	2.0
Child	81	3	3.7
Adolescent	*18*	*2*	*11.1*
Adult	157	11	7.0
Total:	659	24	3.6
Grafton Cemetery, Grafton, Illinois, 1834-1873			
Infant	86	1	1.2
Child	40	0	0.0
Adolescent	*18*	*0*	*0.0*
Adult	100	3	3.0
Total:	244	4	1.6
Wells Cemetery, Ooltewah, Tennessee, 1838-1876			
Infant	125	0	0.0
Child	58	2	3.4
Adolescent	*13*	*0*	*0.0*
Adult	158	2	1.3
Total:	354	4	1.1
Alameda-Stone Cemetery, Tucson, Arizona, 1860s-1875			
Infant	381	8	2.0
Child	88	3	3.4
Adolescent	*36*	*0*	*0.0*
Adult	415	24	5.8
Total:	920	35	3.8
Freedman Cemetery, Dallas, Texas, 1869-1907			
Infant	415	27	6.5
Child	53	8	15.1
Adolescent	*56*	*6*	*10.7*
Adult	601	46	7.7
Total:	1125	87	7.7

Table 10.5., continued.

Age Class	# of burials	# with secular grave goods	% with secular grave goods
Avondale Burial Place, Bibb County, Georgia, 1869-1935			
Infant	40	3	7.5
Child	20	2	10.0
Adolescent	*3*	*0*	*0.0*
Adult	36	4	11.1
Total:	99	9	9.1
Dove Cemetery, Atascadero, California, 1870s-1890s			
Infant	3	0	0.0
Child	1	0	0.0
Adolescent	*1*	*0*	*0.0*
Adult	12	1	8.3
Total:	17	1	5.9
Milwaukee County Poor Farm Cemetery, Wauwatosa, Wisconsin, 1882-1925			
Infant	256	1	0.4
Child	2	0	0.0
Adolescent	*12*	*2*	*16.7*
Adult	318	10	3.1
Total:	588	13	2.2
Totals (Pooled sample)			
Infant	1732	48	2.8
Child	350	18	5.1
Adolescent	*160*	*10*	*6.3*
Adult	1841	102	5.5
Total:	4083	178	4.4

A complete list of secular grave goods recovered from burials in the nine comparative cemeteries can be found in Appendix F, along with interpretations of intentional or accidental inclusion. The most commonly included items are coins or coin-like objects, which were found in 65 graves from eight of the comparative cemeteries – all except the Second Catholic Graveyard in St. Louis – and two graves in the Third Street Cemetery. Some of the coins were perforated, indicating use as charms during life, while others were found in the orbital sockets (or near the cranium) indicating placement according to folk beliefs regarding payment for passage into the afterlife (Davidson 2004b, 2010). Some coins were recovered from the hip areas or the lower chest, suggesting placement in a pocket. In these cases, it is impossible to determine whether the coins were intentionally deposited with the dead or merely overlooked when dressing the deceased in his or her own clothes.

While coins were ubiquitous, other personal items were common only in one or two burial grounds. The 16 metal picture frames recovered from the Alameda-Stone Cemetery were unique among the cemetery collections, with only one other example – the ambrotype photograph from the adolescent grave at the Third Street – identified. Two photographs and remnants of one drawing were recovered, but the contents of the majority of the frames were not preserved. Images likely included photographs of loved ones and artistic renderings of saints.

Fifteen burials with glass bottles (medicine, perfume, and other) were found in the Alameda-Stone and Freedman Cemeteries. The three small bottles from Alameda-Stone were recovered from infant graves and were interpreted as containers for holy water (Heilen and Gray 2010a:255). Bottles at Freedman Cemetery were found with individuals of all ages. The inclusion of medicine bottles was believed to help the deceased thrive in the afterlife. Other types of bottles were simply domestic items deposited in graves, like the cups and dishes also found at the site, for the deceased to use in the afterlife, an African-American tradition (Peter *et al.* 2000:435, 454-455).

Only 10 out of 160 adolescents in the comparative sample were buried with nonreligious items (Table 10.6). For the most part, their grave goods fall into the same categories as those found with adults. Coins, a plate, and a bottle represent folk beliefs, while the pocketknife at Freedman Cemetery and the unidentified objects from the 16-year-old's grave at Voegtly were likely favourite personal items. While it is tempting to assign meaning to the skeleton key found on the ribs of the teenager from the MCPFC, the disarticulated state of the anatomised skeleton, which was deposited in a coffin with at least two other individuals, indicates that the key was simply disposed of in the burial container. However, the shoe found near the cranium of the adolescent male from the MCPFC likely *does* represent the interment of the individual with folk ritual. Davidson (2010) has documented at least nine cases of individuals buried with a single shoe on the coffin lid, and has found evidence for seven more possible cases, primarily in African American cemeteries. He interprets this inclusion as a creolised practice, combining an African belief in the liminal state of the soul after death with traditions from the British Isles, where shoes were once regarded as objects with magical potential and as traps for evil (Davidson 2010). Attempts to determine ancestry for the adolescent male buried with the shoe at the MCPFC were hindered by damage to the facial skeleton. Results from the FORDISC discriminant function software (Jantz and Ousely 2005) and dental morphology analysis (Irish 2015) were ambiguous. However, the maxillary palate was hyperbolic in shape, and the molars exhibited crenulation. Both traits suggest possible African ancestry (Byers 2008; Pilloud 2018).

Table 10.6. Secular grave goods recovered from adolescent burials in the comparative cemetery sample.

Burial #	Age	Sex	Object	Location	Inclusion type	Interpretation
Voegtly Cemetery, Pittsburgh, Pennsylvania, 1833-1861						
100	ca. 16.5 yr	Female	Unidentified orange spherical object and red object	Sphere near left shoulder; red object near hands	Intentional	Personal?
590	17-22 yr	Female	2 pennies, one dated 1841	Eye sockets	Intentional	Folk belief
Freedman Cemetery, Dallas, Texas, 1869-1907						
110	16.6 yr	Female	Doll	Along upper right arm	Intentional	Folk belief?
320	14.5 yr	Female	Doll	Near right foot	Intentional	Folk belief?
466	14.5 yr	Male	1898 penny	Lower body	Intentional	Folk belief
859	19.4 yr	Indet.	Doll	On coffin lid	Intentional	Folk belief?
1126	19.0 yr	Male	Plate	On coffin lid	Intentional	Folk belief
1397	18.5 yr	Female	Doll, pocket knife, coin purse; medicine bottle	Around thorax	Intentional	Personal; Folk belief
Milwaukee County Poor Farm Cemetery, Wauwatosa, Wisconsin, 1882-1925						
10093	18-22 yr	Male	Woman’s shoe	Near cranium	Intentional	Folk belief
10881	15-18 yr	Indet.	Iron skeleton key	On left ribs	Accidental	Rubbish

10.4.1. ADOLESCENTS WITH DOLLS

One nonreligious item, which appears in four of the ten adolescent graves, was not recovered from any adult burials in the comparative sample. Of the 12 dolls discovered in the sample, two were found with infants and six were found with younger children. That four of the dolls were buried with adolescents, including young women 18 or 19 years old, seems inconsistent with the pattern observed at Third Street, where even young teenagers were dressed up as little adults for the grave. The possibility that the toys related to everyday play activities is cast in an unlikely light by the following passage from the memoirs of Clarissa Hobbs, who grew up in Galena (across the Mississippi River from Dubuque) in the 1830s and 1840s. Relating an embarrassing incident at a party she attended at the age of 17, she writes:

> …a full-fledged young lady! I sure was quite set up, but alas, my vanity received a blow at the first party of ladies and gentlemen which I attended a few weeks after my arrival home. A pretty doll lay on a piano… I was sitting beside a man who was rather verging towards old bachelorhood. He took this doll in his hand, and looking at me, said, "Miss Clara, I suppose it's not long since you left off playing with dolls." I was sitting so dignified and prim at my first party of grown-ups. To be insulted in that way, and by one calling himself a gentleman! I tried to wither him with a look and silence, got up and changed my seat, to show my indignation at what I felt an insult to my mature years [Hobbs 1974, not paginated].

Previous publications on the Freedman Cemetery excavation have not noted the unusual nature of this grave inclusion (Davidson 2004a; Peter *et al.* 2000). A doll could be a treasured possession retained from childhood, previously given to a younger sibling or laid away for a future generation, but returned to the former owner at her death. However, another explanation, which is less dependent on idiosyncratic sentiment and thus would account for multiple cases, is possible.

Across the continent of Africa, numerous groups produce fertility dolls of various materials, many of which are utilised in ceremonies marking rites of passage for girls and women. Dolls such as the *mwana hiti* of the Zaramo (in Tanzania) are activated by members of a girl's clan before being presented to her as a symbol of future children (Cameron 1997). Fertility dolls traditional to the South Sotho people (South Africa) include pendant dolls worn on long strings by girls of courting age and larger figures used by young women during wedding ceremonies to indicate their desire to bear children (Wood 1998). The South Sotho also present dolls to teenage girls who are "graduating" from the long initiation process that formalises their transition from childhood to adulthood. Of particular relevance is a modern South Sotho practice, which incorporates Barbie™ dolls rather than handmade figurines in the procession that signifies the completion of initiation (Van Wyx 1998). Bearing this flexibility of tradition in mind, it is not outside the realm of possibility that the dolls found in Freedman Cemetery were more than childhood playthings. The placement of dolls in the graves of teenage girls may have been an expression of the mourners' thwarted hopes for descendants, or even a safeguard for their daughters' fertility in the afterlife. No historic references to the practice of burying young women in the African American community with dolls were found during the current study, but this may reflect the inadequacies of collected oral histories. Davidson (2004a, 2010) found no documentation of the tradition of placing a shoe on the coffin lid, yet numerous examples of this practice have been found in excavated cemeteries.

10.5. Religious Grave Goods

Only four of the burial grounds in the comparative sample were Catholic or included known Catholic interments. The cemeteries' average rates of inclusion of religious grave goods were variable (Table 10.7). Almost 17% (13/77) of individuals buried in the Second Catholic Graveyard in St. Louis were interred with religious objects such as rosaries and saints' medals. The two burial grounds with majority Hispanic Catholic populations – Alameda-Stone and Dove Cemeteries – exhibited high rates of religious grave goods inclusion, 33.7% (310/920) and 17.6% (3/17), respectively. The rate for the MCPFC was extremely low (1.7%, 10/588), as would be expected, regardless of the number of Catholics and Eastern Orthodox[5] among the dead, in an institutional graveyard where municipal authorities set the mortuary programme. In the analysis of grave goods from the first excavation of the cemetery, Richards (1997) hypothesised that burials containing religious objects represented interments of private citizens whose families could not afford funerals but were active in the pauper burial process (Richards 1997:251-266). Voegtly Cemetery is not included in

5 A three-bar Eastern Orthodox cross was recovered from a child's grave during the first excavation of the MCPFC in 1991-1992.

the Table 10.7, as it was reportedly used exclusively by the Swiss-German Voegtly Evangelical Lutheran Church. Nevertheless, a rosary and a religious medal were recovered from two graves at the site, unusual finds in a Protestant cemetery. Additionally, seven infant and child burials at Voegtly yielded wire fragments from the cranial area. Though these fragments were interpreted by excavators as bonnet frames, it is likely that they represented remnants of German funeral wreaths traditionally placed on the heads of deceased children under the age of 12, and sometimes in the graves of young women of marriage age (Kindt 1868:429; Lippok and Mueller-Pfeifruck 2009).

Table 10.7. Number and percentage of individuals from four of the comparative cemeteries interred without and with religious grave goods, divided by age class. Cemeteries are arranged chronologically, oldest to most recent.

Age Class	# of burials	# w/o religious grave goods	% w/o religious grave goods	# with religious grave goods	% with religious grave goods
Second Catholic Graveyard, St. Louis, Missouri, 1824-1850s					
Infant	23	21	91.3	2	8.7
Child	7	6	85.7	1	14.3
Adolescent	*3*	*2*	*66.7*	*1*	*33.3*
Adult	44	35	79.5	9	20.5
Total:	77	64	83.1	13	16.9
Alameda-Stone Cemetery, Tucson, Arizona, 1860s-1875					
Infant	381	196	51.4	185	48.6
Child	88	57	64.8	31	35.2
Adolescent	*36*	*31*	*86.1*	*5*	*13.9*
Adult	415	326	78.6	89	21.4
Total:	920	610	66.3	310	33.7
Dove Cemetery, Atascadero, California, 1870s-1890s					
Infant	3	2	66.7	1	33.3
Child	1	1	100.0	0	0.0
Adolescent	*1*	*1*	*100.0*	*0*	*0.0*
Adult	12	10	83.3	2	16.7
Total:	17	14	82.4	3	17.6
Milwaukee County Poor Farm Cemetery, Wauwatosa, Wisconsin, 1882-1925					
Infant	256	253	98.8	3	1.2
Child	2	2	100.0	0	0.0
Adolescent	*12*	*11*	*91.7*	*1*	*8.3*
Adult	318	312	98.1	6	1.9
Total:	588	578	98.3	10	1.7
Totals (Pooled sample)					
Infant	663	472	71.2	191	28.8
Child	98	66	67.3	32	32.7
Adolescent	*52*	*45*	*86.5*	*7*	*13.5*
Adult	789	683	86.6	106	13.4
Total:	1602	1266	79.0	336	21.0

As observed in the Third Street Cemetery, there appears to be no significant pattern of adolescents being buried more or less frequently with religious grave goods, though the low numbers of adolescents in three of the burial grounds prevent reliable assessment. Alameda-Stone Cemetery provides a sufficient population, but the pattern of the distribution of religious objects is the opposite of that observed at Third Street. At Alameda-Stone, adolescents have the lowest proportion of graves with religious objects, while infants and children have the highest. This flipped distribution can be explained by the prevalence of floral wreaths in the graves of infants and children. This tradition is particularly popular among Hispanic Catholics even today (see Ball 2003:329-330 for a discussion of dressing children as *los angelitos*). If calculations eliminate individuals whose only religious object is a wreath, the pattern at Alameda-Stone more closely resembles that of Third Street (Table 10.8). However, the frequency of religious grave goods found with adolescents at Alameda-Stone is still much lower than that of adults, rather than slightly higher. The lack of personal and religious objects in adolescent graves at Alameda-Stone will be addressed further in Section 10.8.4.

Table 10.8. Number and percentage of individuals from the Alameda-Stone and Third Street Cemeteries interred without and with religious grave goods, not including wreaths.

Age Class	# of burials	# w/o religious grave goods	% w/o religious grave goods	# with religious grave goods	% with religious grave goods
Alameda-Stone Cemetery, Tucson, Arizona, 1860s-1875					
Infant	381	353	92.7	28	7.3
Child	88	83	94.3	5	5.7
Adolescent	*36*	*33*	*91.7*	*3*	*8.3*
Adult	415	329	79.3	86	20.7
Total:	920	798	86.7	122	13.3
Third Street Cemetery, Dubuque, Iowa, ca. 1833-1880					
Infant	371	332	89.5	39	10.5
Child	68	63	92.6	5	7.4
Adolescent	*41*	*31*	*75.6*	*10*	*24.4*
Adult	325	251	77.2	74	22.8
Total:	805	677	84.1	128	15.9

One religious object recovered from a teenager's grave at Alameda-Stone Cemetery merits a separate discussion. A 12- to 15-year-old of undetermined sex (Burial 8965) was buried with an oval-shaped brass locket containing an adult distal hand phalanx. This reliquary was unique among objects recovered from Alameda-Stone or any of the other cemeteries researched during this project. The author is aware of only one other case in which a reliquary containing human bone has been discovered in a burial context in the United States. A small silver box with seven bone fragments was discovered in the grave of Captain Gabriel Archer, who died in Jamestown, Virginia, in 1609 (Allison 2016). Though personal ownership of small saints' reliquaries was more common among New World Spanish Catholics than other populations in the United States (Olivera and Pierce 1996:92-97), the deposition of such a valuable object in the grave of this young individual speaks to the high regard the principal mourners had for the teenager. The placement of the reliquary cannot be considered an expression of ostentatious mortuary display or conspicuous consumption, as the locket bore no external decoration or indication of its contents, and as fabric impressions on the corroded surface indicate the locket was concealed under clothing or a winding sheet. The fact that this adolescent alone was interred with an exceptional funerary object suggests that some families in Tucson regarded teenage deaths as particularly tragic, despite the apparently careless mortuary treatment afforded to many other young individuals in the cemetery.

10.6. Age and Burial Types

Burial type was determined for all 4,083 individuals in the comparative cemeteries sample, based on presence and categories of coffin hardware and the classification of burial attire inferred from clothing fasteners. As defined in Chapter 9, interments were divided into the following six groups: Type 1 (plain coffin [or no coffin], burial in a shroud); Type 2 (plain coffin [or no coffin], burial in day wear); Type 3 (simple coffin hardware, shroud attire); Type 4 (simple coffin, day wear attire); Type 5 (elaborate coffin hardware, shroud attire); and Type 6 (elaborate coffin, day wear attire). The number and percentage of individuals of each age class assigned to the burial types is found in Table 10.9, with proportions illustrated visually in Figures 10.2-10.10.

Some of the cemetery samples do not include examples of all six burial types. Among these, the Second Catholic Graveyard is notable for its lack of Burial Types 3 through 6. The active use period of this cemetery predates the availability and popularity of mass-produced coffin hardware, and thus all individuals were buried in plain coffins. Conversely, during later parts of the nineteenth century, decorative hardware was so readily available that ornamented coffins always included multiple elements of embellishment. This trend resulted in the absence or near absence of simple coffins (Burial Types 3 and 4) in the four most recent cemeteries.

In six of the cemetery populations, adolescents were found to have a higher frequency of Type 6 burials (yellow highlighted cells in Table 10.9). Unfortunately, the sample sizes of Voegtly, Grafton, Wells, Avondale, and Dove Cemeteries are too small for reliable chi-square tests, as there are many expected numbers <5. Freedman Cemetery provides a sufficient sample but, given the frequency of Type 6 burials for individuals of all ages other than infants in that population, the adolescent proportion was not found to be significantly larger. The three burial grounds that did not exhibit a pattern of elaborate mortuary treatment for adolescents – Second Catholic Graveyard, Alameda-Stone Cemetery, and the MCPFC – are temporally, as well as spatially, distant from one another. Though a general lack of mortuary elaboration in the sample explains the absence of observable special treatment for teenagers in the Second Catholic Graveyard, the pattern seen in the other two cases appears related to nonfamilial funeral preparations (see Section 10.8 for discussion).

When burials from all nine cemeteries are pooled, the sample size is sufficient for statistical analysis. Given the clearly lower frequency of elaborate burials for infants, that age group was eliminated from the comparison. A chi-square test of independence including children, adolescents, and adults in all burial types, found that adolescents were significantly more likely to be interred in Type 6 burials ($\chi^2=122.167$, $df=10$, $p=0.000$). Children were more likely to have Type 1 or Type 3 burials, while adults were more likely to have Type 5. That the pooled sample indicates a greater tendency for mortuary elaboration in adolescent graves, even when cemetery populations exhibiting the opposite trend were included, demonstrates the strength of the association.

Table 10.9. Number and percentage of individuals from the nine comparative cemeteries interred in each burial type, divided by age class. Cemeteries are arranged chronologically, oldest to most recent. Yellow highlighting denotes cells which appear to demonstrate a higher frequency of Type 6 burials for adolescents within a cemetery population.

Age Class	**Type 1-plain coffin, shroud**		**Type 2-plain coffin, day wear**		**Type 3-simple coffin, shroud**		**Type 4-simple coffin, day wear**		**Type 5-elaborate coffin, shroud**		**Type 6-elaborate coffin, day wear**	
	#	**%**	**#**	**%**	**#**	**%**	**#**	**%**	**#**	**%**	**#**	**%**
Second Catholic Graveyard, St. Louis, Missouri, 1824-1850s												
Infant	23	100.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Child	6	85.7	1	14.3	0	0.0	0	0.0	0	0.0	0	0.0
Adolescent	*3*	*100.0*	*0*	*0.0*	*0*	*0.0*	*0*	*0.0*	*0*	*0.0*	*0*	*0.0*
Adult	31	70.5	13	29.5	0	0.0	0	0.0	0	0.0	0	0.0
Total:	63	81.8	14	18.2	0	0.0	0	0.0	0	0.0	0	0.0
Voegtly Cemetery, Pittsburgh, Pennsylvania, 1833-1861												
Infant	311	77.2	8	2.0	42	10.4	5	1.2	29	7.2	8	2.0
Child	55	67.9	2	2.5	11	13.6	3	3.7	7	8.6	3	3.7
Adolescent	*11*	*61.1*	*2*	*11.1*	*0*	*0.0*	*1*	*5.6*	*2*	*11.1*	*2*	*11.1*
Adult	114	72.6	15	9.6	10	6.4	7	4.4	4	2.6	7	4.4
Total:	491	74.5	27	4.1	63	9.6	16	2.4	42	6.4	20	3.0
Grafton Cemetery, Grafton, Illinois, 1834-1873												
Infant	46	53.5	0	0.0	17	19.8	0	0.0	20	23.2	3	3.5
Child	20	50.0	1	2.5	7	17.5	1	2.5	9	22.5	2	5.0
Adolescent	*6*	*33.3*	*2*	*11.1*	*1*	*5.6*	*0*	*0.0*	*5*	*27.8*	*4*	*22.2*
Adult	38	38.0	9	9.0	11	11.0	8	8.0	18	18.0	16	16.0
Total:	110	45.1	12	4.9	36	14.8	9	3.7	52	21.3	25	10.2

Table 10.9., continued.

Age Class	Type 1-plain coffin, shroud		Type 2-plain coffin, day wear		Type 3-simple coffin, shroud		Type 4-simple coffin, day wear		Type 5-elaborate coffin, shroud		Type 6-elaborate coffin, day wear	
	#	%	#	%	#	%	#	%	#	%	#	%
Wells Cemetery, Ooltewah, Tennessee, 1838-1876												
Infant	78	62.4	3	2.4	24	19.2	4	3.2	16	12.8	0	0.0
Child	28	48.3	5	8.6	13	22.4	2	3.5	9	15.5	1	1.7
Adolescent	*5*	*38.4*	*1*	*7.7*	*3*	*23.1*	*2*	*15.4*	*0*	*0.0*	*2*	*15.4*
Adult	71	44.9	17	10.8	21	13.3	18	11.4	16	10.1	15	9.5
Total:	182	51.4	26	7.3	61	17.3	26	7.3	41	11.6	18	5.1
Alameda-Stone Cemetery, Tucson, Arizona, 1860s-1875												
Infant	227	59.6	139	36.5	5	1.3	2	0.5	5	1.3	3	0.8
Child	17	19.3	68	77.3	0	0.0	1	1.1	0	0.0	2	2.3
Adolescent	*7*	*19.4*	*29*	*80.5*	*0*	*0.0*	*0*	*0.0*	*0*	*0.0*	*0*	*0.0*
Adult	75	18.1	313	75.4	1	0.2	11	2.7	2	0.5	13	3.1
Total:	326	35.4	549	59.7	6	0.7	14	1.5	7	0.8	18	1.9
Freedman Cemetery, Dallas, Texas, 1869-1907												
Infant	58	14.0	11	2.7	0	0.0	0	0.0	277	66.7	69	16.6
Child	1	1.9	3	5.6	0	0.0	0	0.0	24	45.3	25	47.2
Adolescent	*3*	*5.4*	*6*	*10.7*	*0*	*0.0*	*0*	*0.0*	*12*	*21.4*	*35*	*62.5*
Adult	35	5.8	40	6.7	0	0.0	0	0.0	198	32.9	328	54.6
Total:	97	8.6	60	5.4	0	0.0	0	0.0	511	45.4	457	40.6
Avondale Burial Place, Bibb County, Georgia, 1869-1935												
Infant	33	82.5	6	15.0	0	0.0	0	0.0	1	2.5	0	0.0
Child	10	50.0	2	10.0	0	0.0	0	0.0	5	25.0	3	15.0
Adolescent	*0*	*0.0*	*1*	*33.3*	*0*	*0.0*	*0*	*0.0*	*0*	*0.0*	*2*	*66.7*
Adult	9	25.0	15	41.7	0	0.0	0	0.0	5	13.9	7	19.4
Total:	52	52.5	24	24.3	0	0.0	0	0.0	11	11.1	12	12.1

Table 10.9., continued.

Age Class	Type 1-plain coffin, shroud		Type 2-plain coffin, day wear		Type 3-simple coffin, shroud		Type 4-simple coffin, day wear		Type 5-elaborate coffin, shroud		Type 6-elaborate coffin, day wear	
	#	%	#	%	#	%	#	%	#	%	#	%
Dove Cemetery, Atascadero, California, 1870s-1890s												
Infant	2	66.7	0	0.0	0	0.0	0	0.0	0	0.0	1	33.3
Child	1	100.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Adolescent	*0*	*0.0*	*0*	*0.0*	*0*	*0.0*	*0*	*0.0*	*0*	*0.0*	*1*	*100.0*
Adult	1	8.3	2	16.7	1	8.3	0	0.0	0	0.0	8	66.7
Total:	4	23.5	2	11.7	1	5.9	0	0.0	0	0.0	10	58.9
Milwaukee County Poor Farm Cemetery, Wauwatosa, Wisconsin, 1882-1925												
Infant	242	94.5	9	3.5	0	0.0	0	0.0	4	1.6	1	0.4
Child	0	0.0	0	0.0	0	0.0	0	0.0	1	50.0	1	50.0
Adolescent	*3*	*25.0*	*1*	*8.3*	*0*	*0.0*	*0*	*0.0*	*6*	*50.0*	*2*	*16.7*
Adult	31	9.8	0	0.0	0	0.0	0	0.0	264	83.0	23	7.2
Total:	276	46.9	10	1.7	0	0.0	0	0.0	275	46.8	27	4.6
Totals (Pooled sample)												
Infant	1020	58.9	176	10.2	88	5.1	11	0.6	352	20.3	85	4.9
Child	138	39.4	82	23.4	31	8.9	7	2.0	55	15.7	37	10.6
Adolescent	*38*	*23.8*	*42*	*26.2*	*4*	*2.5*	*3*	*1.9*	*25*	*15.6*	*48*	*30.0*
Adult	405	22.0	424	23.0	44	2.4	44	27.5	507	27.5	417	22.6
Total:	1601	39.2	724	17.7	167	4.1	65	1.6	939	23.0	587	14.4

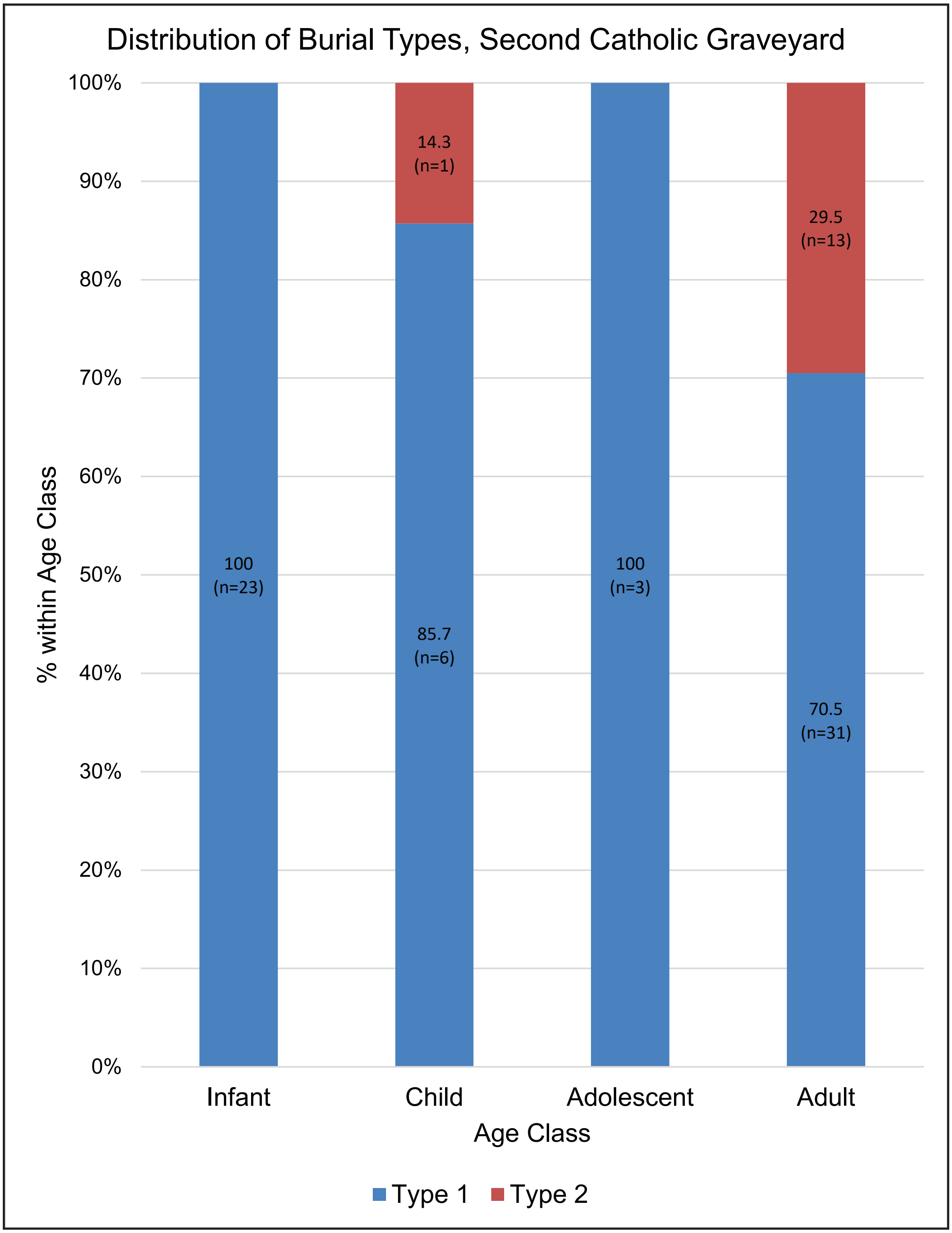

Figure 10.2. Second Catholic Graveyard (St. Louis, Missouri). Graph showing the percentage of individuals in each age class assigned to the six burial types defined in Table 10.9.

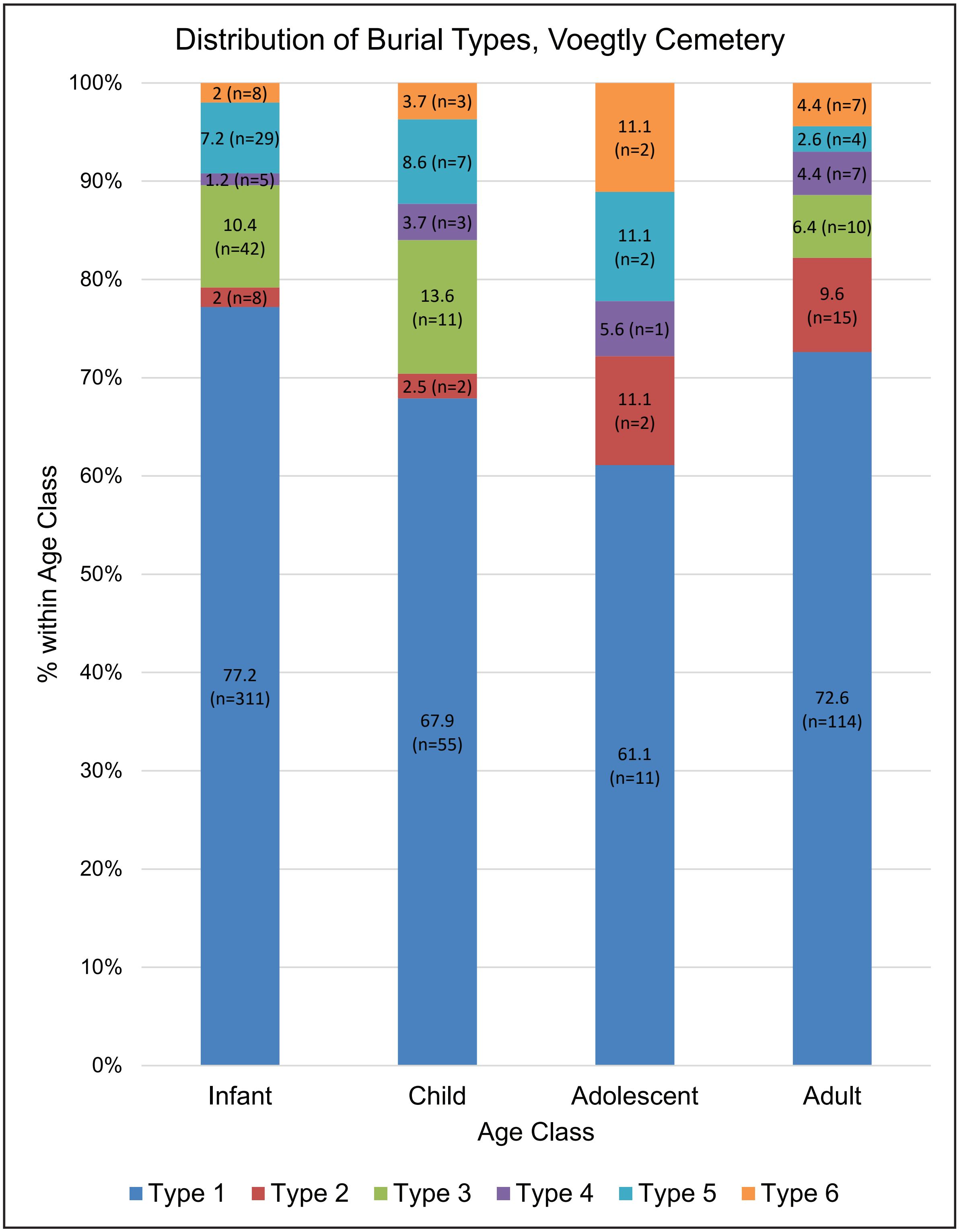

Figure 10.3. Voegtly Cemetery (Pittsburgh, Pennsylvania). Graph showing the percentage of individuals in each age class assigned to the six burial types defined in Table 10.9.

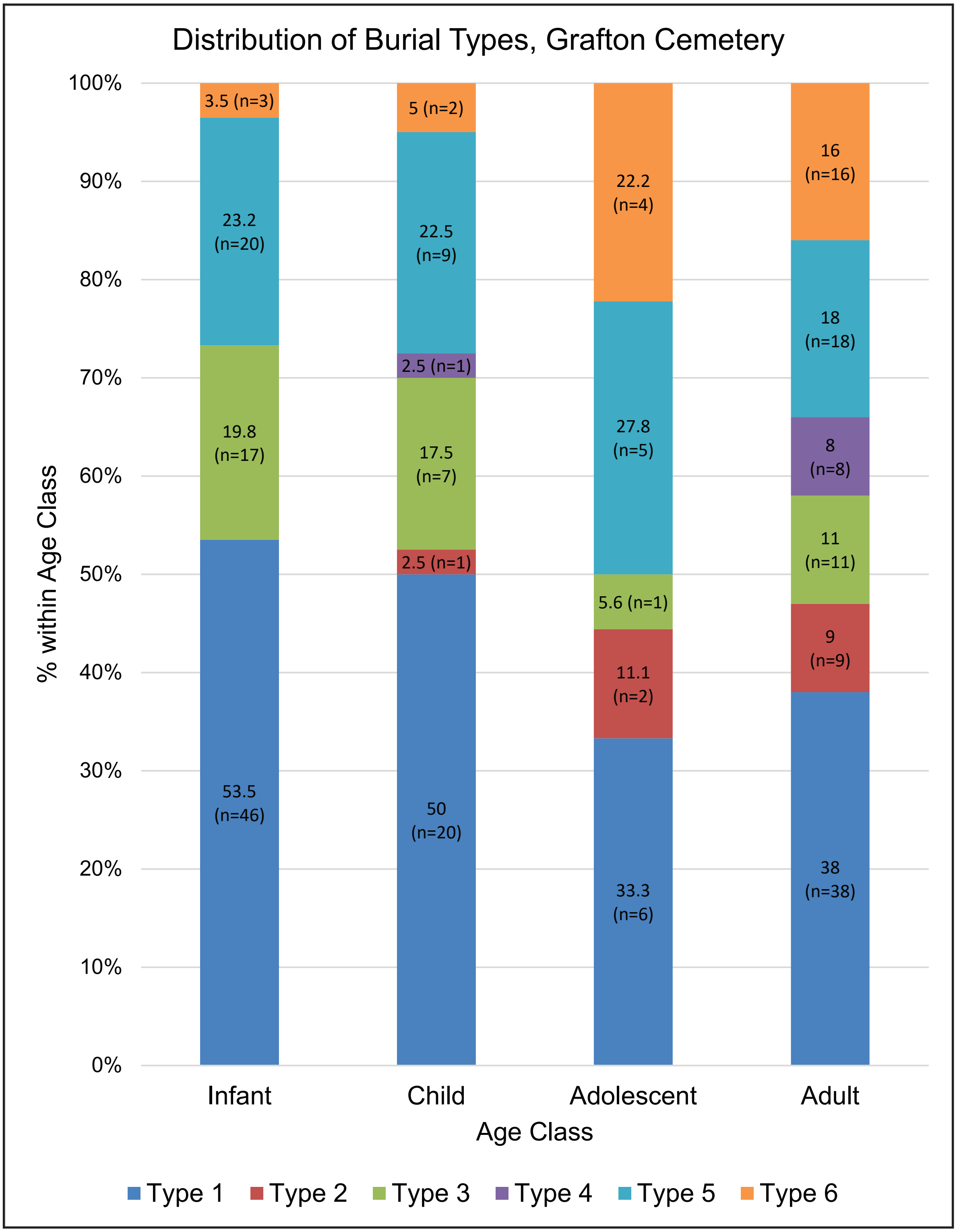

Figure 10.4. Grafton Cemetery (Grafton, Illinois). Graph showing the percentage of individuals in each age class assigned to the six burial types defined in Table 10.9.

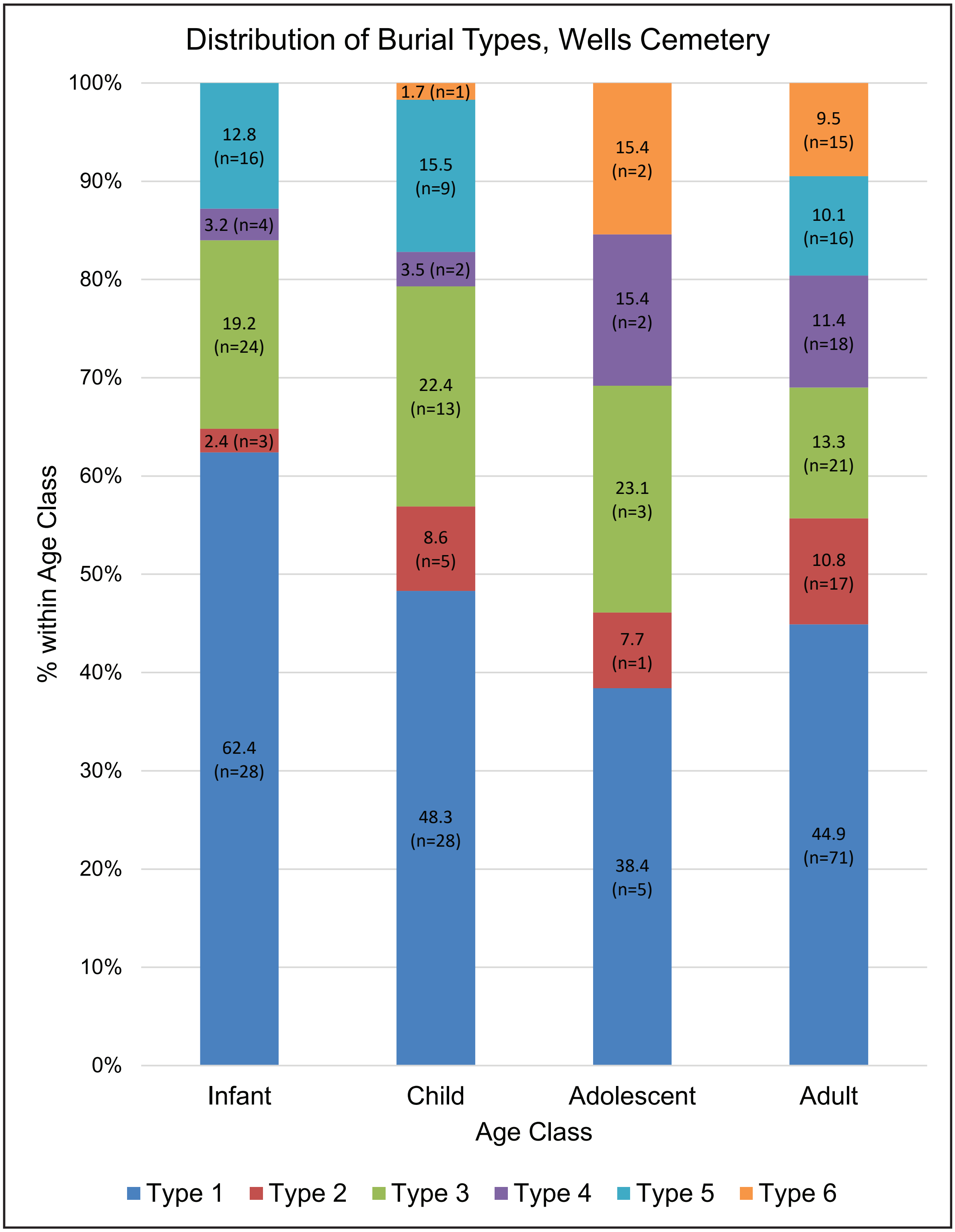

Figure 10.5. Wells Cemetery (Ooltewah, Tennessee). Graph showing the percentage of individuals in each age class assigned to the six burial types defined in Table 10.9.

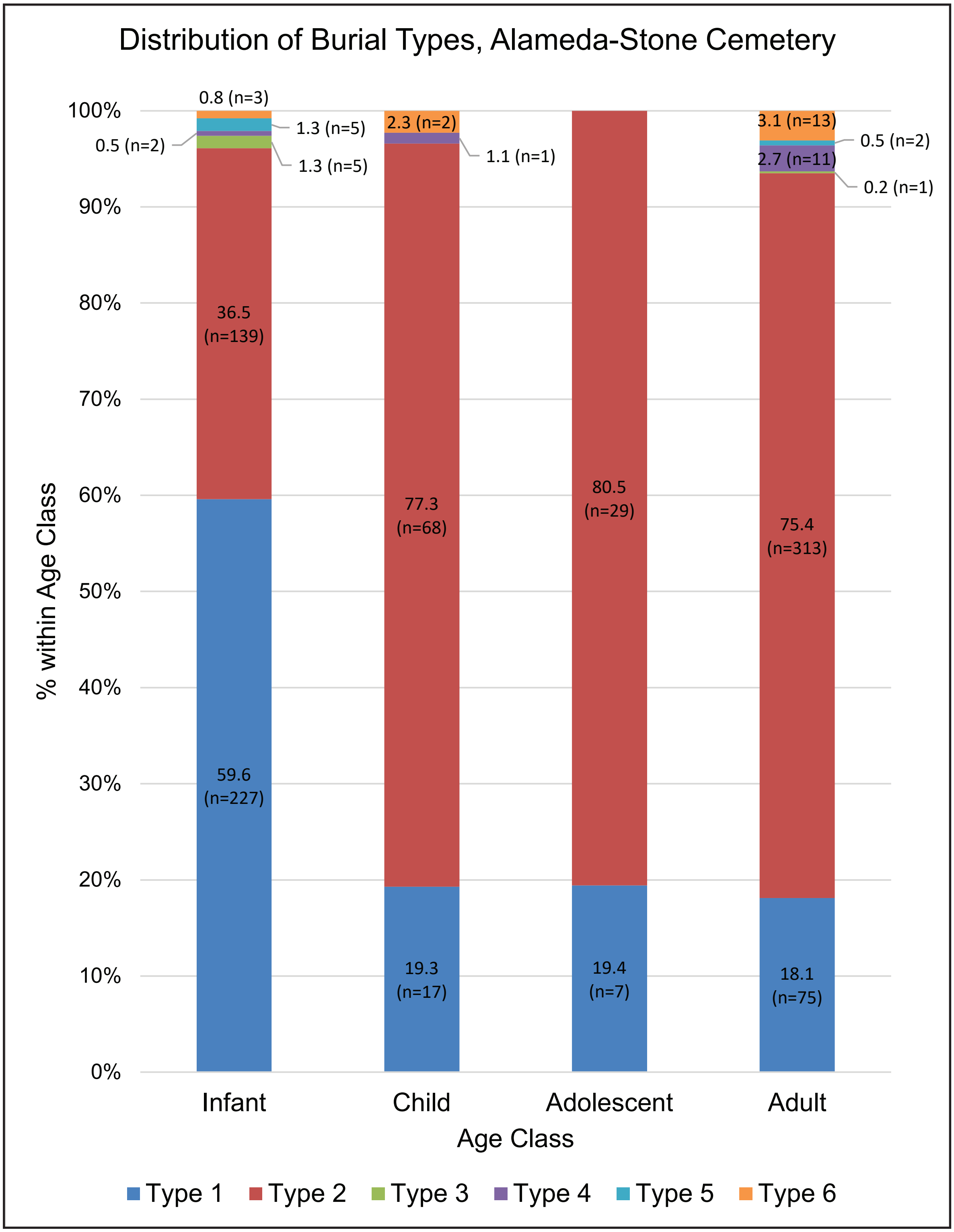

Figure 10.6. Alameda-Stone Cemetery (Tucson, Arizona). Graph showing the percentage of individuals in each age class assigned to the six burial types defined in Table 10.9.

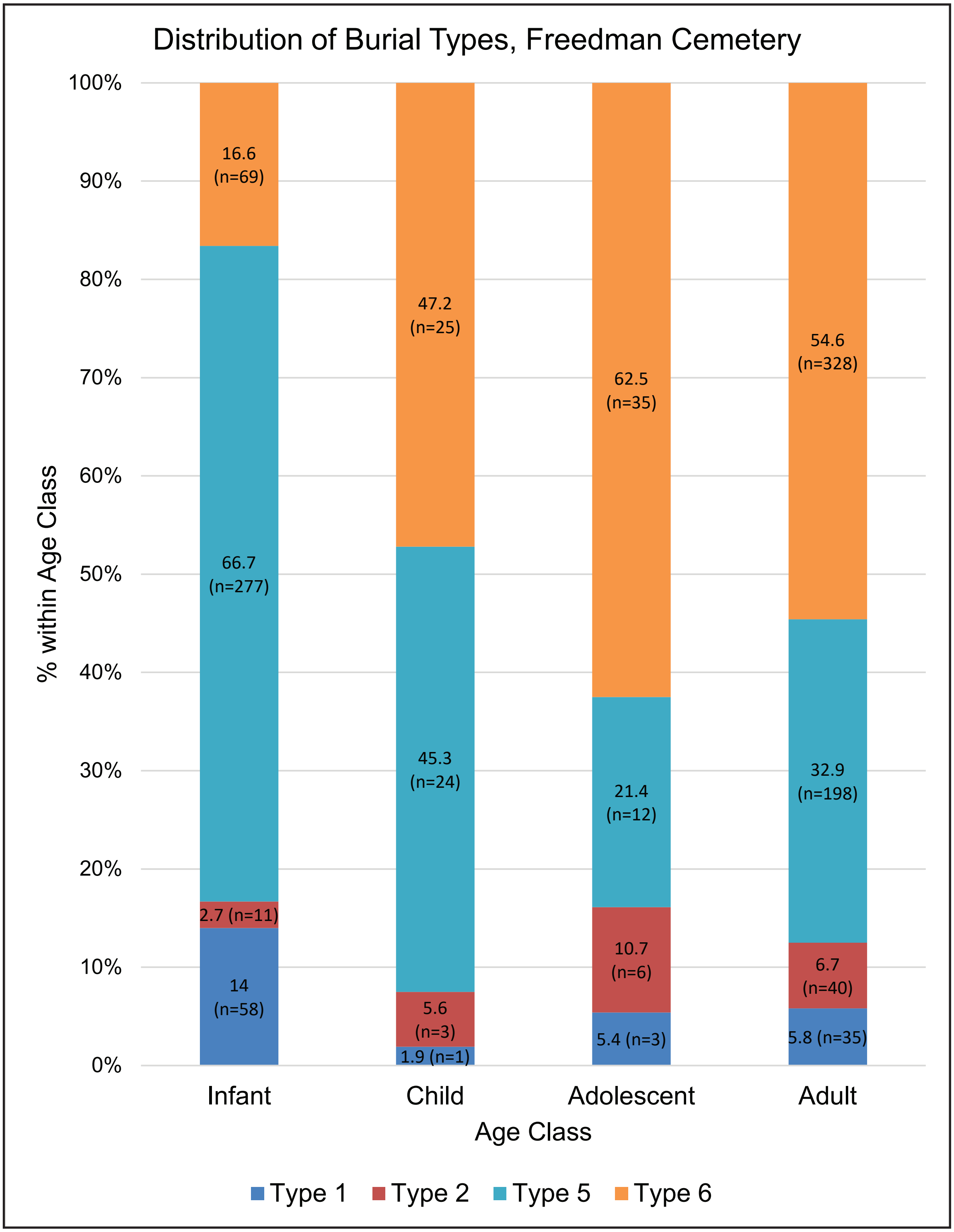

Figure 10.7. Freedman Cemetery (Dallas, Texas). Graph showing the percentage of individuals in each age class assigned to the six burial types defined in Table 10.9.

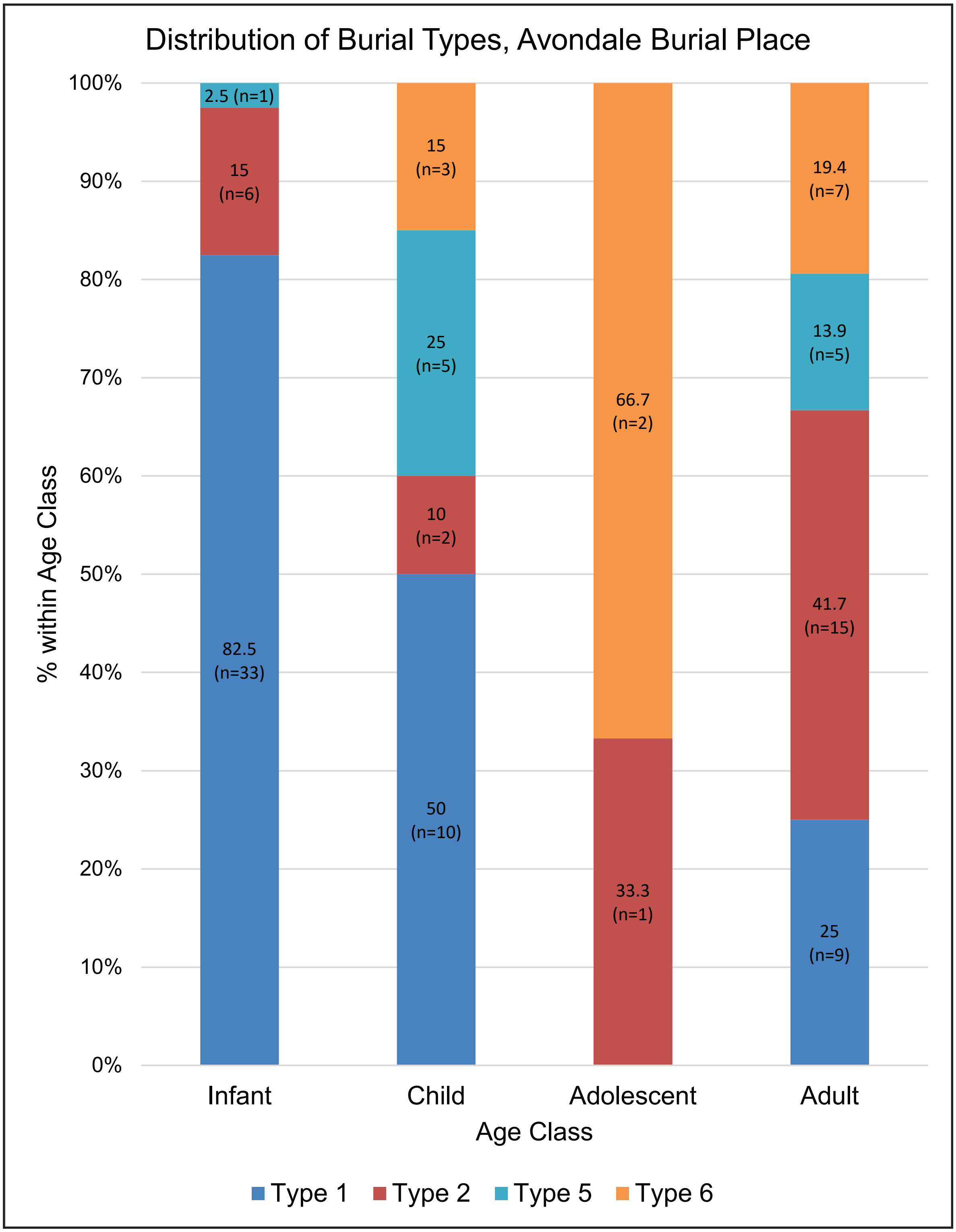

Figure 10.8. Avondale Burial Place (Bibb County, Georgia). Graph showing the percentage of individuals in each age class assigned to the six burial types defined in Table 10.9.

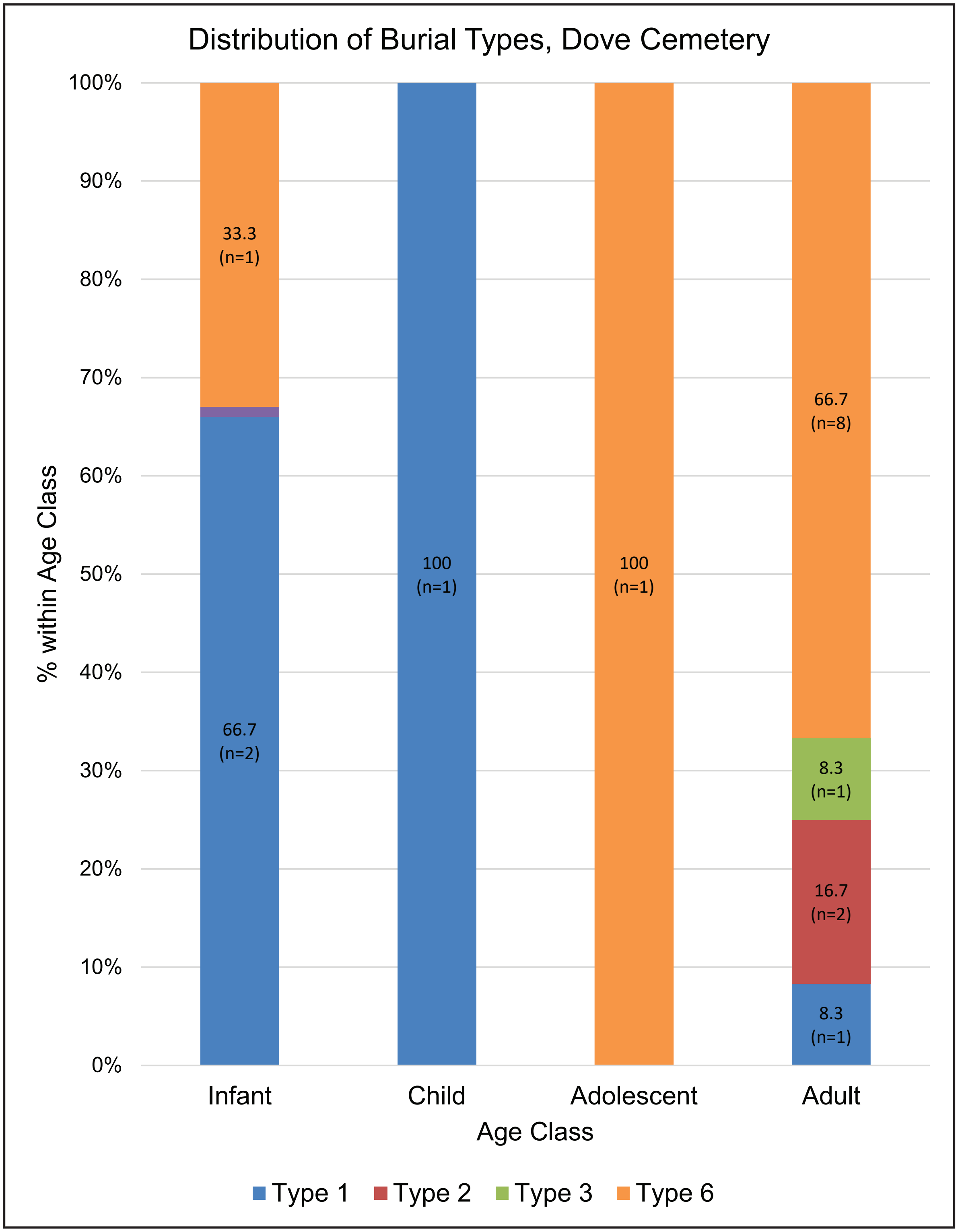

Figure 10.9. Dove Cemetery (Atascadero, California). Graph showing the percentage of individuals in each age class assigned to the six burial types defined in Table 10.9.

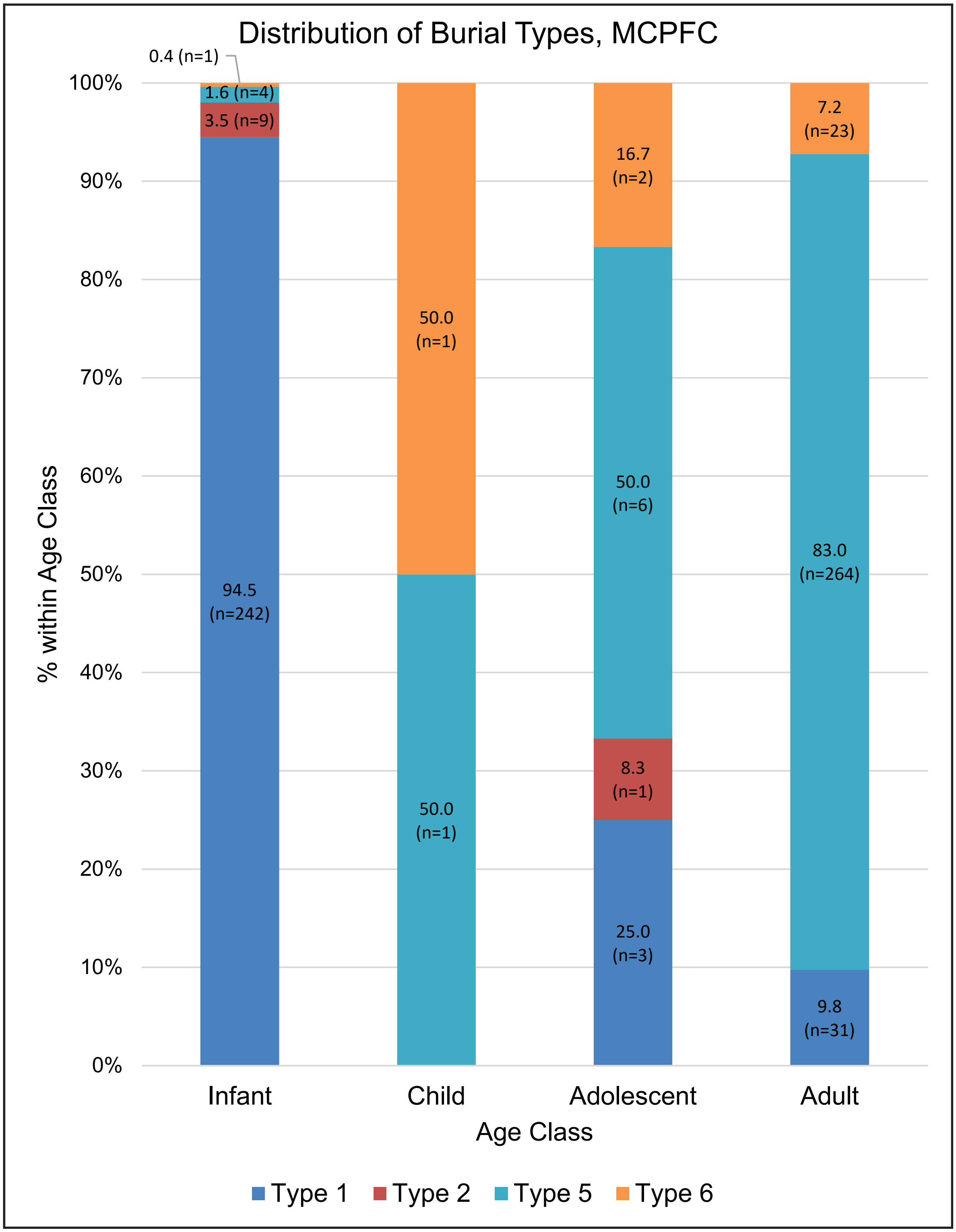

Figure 10.10. Milwaukee County Poor Farm Cemetery (Wauwatosa, Wisconsin). Graph showing the percentage of individuals in each age class assigned to the six burial types defined in Table 10.9.

10.7. Burial Type and Manner of Death

As seen in Chapter 8, evidence for manner of death is scant, even in the larger comparative sample. If adolescents from Third Street are added to this larger set, the group of teenagers with manner of death tentatively assigned includes 18 individuals with chronic disease and seven with evidence of death due to external causes (accidents or violence). The distribution of burial types for this group (Table 10.10) does not include Types 4 or 5, and there is no clear association between chronic disease and elaborate mortuary preparations (Type 6), despite the fact that principal mourners in these cases would have theoretically had more time to make funeral arrangements. The apparent rarity of Type 6 burials for adolescents who died from external causes is due to the fact that over half (4/7) of these teenagers were buried in the Alameda-Stone Cemetery, where no teenagers were found in Type 6 burials.

Note that this group of 25 teenagers includes only individuals from the larger burial populations, with the early Second Catholic Graveyard and the rural Wells, Avondale, and Dove cemeteries contributing no data. Thus, in addition to incorporating only a small portion of the adolescent sample examined in this thesis, this group does not represent the full diversity of timeframes and regions encompassed by the project. Further exploration of this research question will require larger sample sizes.

Table 10.10. Number and percentage of adolescents from Third Street and the comparative cemeteries interred in each burial type, divided by manner of death.

Manner of death	Type 1-plain coffin, shroud		Type 2-plain coffin, day wear		Type 3-simple coffin, shroud		Type 6-elaborate coffin, day wear	
	#	%	#	%	#	%	#	%
Chronic disease	7	38.9	2	11.1	2	11.1	7	38.9
Perimortem trauma	3	42.9	3	42.9	0	0.0	1	14.2
Total:	10	40.0	5	20.0	2	8.0	8	32.0

10.8. Temporal and Regional Trends

The temporal trend of increasing mortuary elaboration in the mid- to late-nineteenth century has been the subject of numerous studies examining both burial practices and mourning fashions (e.g., Bell 1990; Cannon 1989; Crow 2004; LeeDecker 2009; Little *et al.* 1992; Pike and Armstrong 1980; Raemsch and Bouchard 2000). That this trend is demonstrated, to some extent, in the comparative cemetery sample is not surprising. In the earliest burial ground in the study, the Second Catholic Graveyard in St. Louis, no decorative coffin hardware was found, less than 20% (14/77) of individuals were buried in day wear, only one possible personal object was recovered, and only 17% (13/77) of interments included religious grave goods. These burials seem plain indeed when compared with those of Freedman Cemetery, founded 45 years later and used into the early twentieth century. Over 85% (968/1,125) of the Freedman coffins were decorated with elaborate hardware, while almost half of the individuals were buried in day wear, often with fashionable accessories like cuff links and lace pins. Freedman Cemetery also boasts the second highest frequency of secular grave goods. However, linking mortuary elaboration exclusively to time period ignores important issues of urban versus rural variations, cultural preferences, and the East to West expansion of transportation networks carrying ideas as well as goods. Of relevance to the current study are the ways in which these factors affected the American phenomenon of adolescence, as well.

10.8.1. TEMPORAL FACTORS

The two burial grounds with the highest levels of mortuary display, as determined by the percentage of Type 6 interments, are, unsurprisingly, two that were active in the last quarter of the nineteenth century (and beyond). Dove Cemetery (1870s-1890s) was interpreted by the excavators as an “essentially Hispanic” burial ground incorporating Euroamerican spatial organisation and burial containers (Sewell and Stanton 2008:162-164). Prominent members of the Dove community chose to be buried in the Catholic cemetery or other grounds in the town of San Luis Obispo, leaving the country Dove Cemetery populated with lesser-known individuals, like Francisco Guerrero, a labourer who perished in a barn fire reportedly started by his drunken carelessness (Sewell and Stanton 2008:25-27). That even Mr. Guerrero was buried in a decorated casket demonstrates how prevalent mortuary elaboration was at the time of his 1897 death.

Likewise, the excavation of Freedman Cemetery yielded an exceptionally large number of elaborately decorated coffins, as well as a high proportion of Type 6 burials. The 1869 founding date, however, is not representative of the most active period of the burial ground. Using coffin hardware typology, Davidson (1999) determined approximate dates for 1,112 interments, only 64 of which (5.8%) belong to the Early Period, 1869-1884. He dated 170 burials (15.3%) to the Middle Period of 1885-1899, while the majority of the graves (878, 78.9%) date to the Late Period, 1900-1907 (Davidson 1999:201-307). The mortuary elaboration seen in these Late Period burials is interesting, then, because it illustrates the cyclical nature of mortuary behaviour proposed by Cannon (1989). The heavily ornamented coffins at Freedman represent a fashion that had been abandoned by the Euroamerican elite by 1900 and was now considered déclassé (Davidson 2004a:386-390).[6] Amidst all the noise of "busy" coffin decoration and flashy clothing accessories, it is difficult to detect special treatment of adolescents at Freedman Cemetery. However, Davidson's calculations of coffin hardware costs show that in the Early Period, on average, teenagers' coffins were more expensive than those of any other age group, while in the Middle and Late Periods, adolescents' coffins cost the same or less than adults' (Davidson 2004a:246-253). In burial grounds from earlier periods, when more personal decisions were involved in funeral arrangements, differential treatment of teenagers is more easily observable, as opposed to the period following the use of the Third Street Cemetery (post-1880), when the rise of the funeral industry encouraged "personalisation" based on a selection of standard, mass-produced commodities (Farrell 1980:142).

Another temporal issue to consider is the changing status of adolescents. In the 1880s and 1890s, new attitudes and concepts concerning youth and maturation were arising from the middle classes, ideas that would spread to the rest of American

6 Members of the African American community who had the wherewithal to follow the latest trend towards sleek, simple coffins were burying their dead in newly established Woodland Cemetery by this time (Davidson 2004a:388).

society in the early 1900s, providing the basis for the modern social definition of adolescence (Kett 1977:215). In the eastern United States, where the introduction of machines eliminated the need for true apprenticeships, teenagers found themselves displaced from the job market. While the demand for cheap child/teen labour, without any educative component, initially rose with mechanised factory production, union regulations and the availability of inexpensive adult immigrant labour gradually reduced the number of youths in the workforce in states like New York. By the 1880s, the sense that early employment left young men stuck in dead-end factory jobs led families who could afford the luxury to keep their sons in school until the age of 16 or 18 (Kett 1977:144-152). High school enrolment kept older children occupied and living at home at an age considered dangerous due to weak judgement and strong impulses (Kett 1977:127). Many of the high school graduates were female, especially as the century progressed and the education of daughters became a symbol of prestige. Literature warning of the moral and psychological dangers of over-rapid development (both sexual and intellectual) in teenagers led, to some extent, to prolonged dependence of adolescents in the middle class, rendering their transitional period more like an extension of childhood (Kett 1977:129-138). Determining the extent to which this shift in social adolescence affected mortuary treatment in the early twentieth century is beyond the scope of this study. However, it is interesting to note that in the Late Period (1900-1907) at Freedman Cemetery, the average coffin hardware expense for young men 20 to 25 years old was more than double that of most other adult age groups, perhaps suggesting a shift in the investment of hope to sons just past physiological adolescence.

10.8.2. URBAN VERSUS RURAL SETTINGS

Considering that the Avondale Burial Place (1869-1935) is contemporary with both Dove and Freedman Cemeteries, one might expect to find the same level of mortuary elaboration among the excavated graves. The observed infrequency of decorative coffin hardware and low rate of Type 6 burials can be explained by its location in a sparsely populated, rural area with an agricultural economy (Matternes *et al.* 2012:15-36). The social and economic isolation of Southern rural communities prior to the expansion of transportation systems resulted in lack of reliance on market goods and a tendency towards local production, even for mortuary materials (Matternes *et al.* 2012:98). During its active period, the Avondale Burial Ground lay between two railroad lines, less than two miles away from small communities on both lines and only 12 miles south of the county seat at Macon (Matternes *et al.* 2012:15-19). Yet it is evident from the material culture recovered from the cemetery that locally-made coffins were commonly used, a preference which the excavation report authors attribute not to strictly economic restrictions, but to a conscious choice to involve the family and immediate community in burial preparations rather than participate in mainstream American mortuary practices (Matternes *et al.* 2012:135-137, 312-315, 320). However, in their analysis of a cache of coffin hardware found in a rural general store in South Carolina, Hacker-Norton and Trinkley (1984) point to cash-poor customers and conservative rural taste as reasons for the outdated and attenuated range of styles available in the store at the time of the 1926 fire. New ideas and trends are slow to reach rural communities. Acceptance of new trends takes even longer, and the availability of commercial goods accompanying these trends is limited to what local merchants are willing to stock and what local customers can afford (Hacker-Norton and Trinkley 1984:44-48). Together, these factors account for the generally low level of mortuary elaboration at both the Avondale Burial Place and Wells Cemetery.

Wells Cemetery (1838-1876), which is notable for the interment of Alfred M. Cate (Union conspirator and post-war Tennessee senator), likely began as a family cemetery that later served the larger Euroamerican, primarily Protestant community in a rural part of James County (now Hamilton County), Tennessee (McKee 2012). Excavated burials at Wells Cemetery exhibited half the rate of elaborately decorated coffins and Type 6 burials seen at the contemporary, urban Grafton Cemetery on the Mississippi River in Illinois (1834-1873). In fact, the coffins at Wells were often decorated with patterns of simple domed brass upholstery tacks, rather than coffin handles and viewing panes (rare) or lid plates (entirely absent). Yet at both Avondale and Wells, the few adolescents were more frequently buried with Type 6 funeral trappings. Based on purely social factors, special treatment of adolescents might not be expected in country cemeteries. In rural environments, where the family is the working unit, divisions between age groups are less critical than they are in urban settings where the work environment is separated from the home and family (Demos and Demos 1969:632-638). Thus, social adolescence and its concomitant increase in freedoms may not have been experienced the same way in nineteenth-century James County as it was for teenagers in Grafton or Dubuque. However, these experiential differences apparently had little effect on the decisions made by the principal mourners in rural communities, even though procurement of funeral materials readily available in urban centres may have required extra effort for country parents.

10.8.3. CULTURAL VARIATIONS

The most obvious cultural variation in the comparative sample relates to nonreligious grave goods in African American cemeteries. The frequency of inclusion, as well as the presence of multiple objects in some graves, sets these burial grounds apart from the Euroamerican and Hispanic cemeteries comprising the rest of the sample. Moreover, had these cemeteries still been marked and maintained at the time of excavation, archaeologists likely would have been able to associate thousands of additional surface-collected artefacts with individual graves, as the African custom of placing ceramic and glass serving ware (often the last objects touched by the deceased), favourite personal items, and seashells at the locations of graves persisted well into the twentieth century in the United States (Davidson 2004a:285-294). Davidson separates intentional grave inclusions into two types, personal items and object representing Core Elements of Spirituality, the latter category including coins, serving ware, medicine bottles, and a single shoe on the coffin lid (Davidson 2004a:310-312). Interestingly, it appears that adolescents were not deemed more deserving or more in need of either type of grave good at Freedman or Avondale.

Another African American tradition observable at Freedman Cemetery – and Avondale, to a lesser extent – is the use of clothing accessories for signalling access to resources. Though sartorial displays of wealth were often mocked by contemporary Euroamerican observers, they were understood in the African American community to represent the resilience and success of the individual or family (Williams, in press:108). The frequency of clothing accessories in the artefact collection from Freedman Cemetery demonstrates that this signalling was considered appropriate in funerary contexts, as well. Davidson's analysis of grave goods inclusion in relation to mortuary elaboration, which focused on coffin hardware, found that the coffins of individuals buried with items representing Core Elements of Spirituality cost less than the average for each time period, while those of individuals buried with personal items cost more than the average (Davidson 2004a:364-369). He interprets this pattern as evidence of a division in the community between the affluent, who sought to emulate the mainstream consumer culture, and the middle class, some of whom chose to resist the loss of African identity with alternative mortuary practices (Davidson 2004a:371-375). In the current study, the relationship of burial attire to secular items at Freedman was explored. Though 46% (517/1,125) of the overall cemetery population exhibited evidence of burial in a day wear outfit, 65.5% (57/87) of individuals with grave goods of any kind were buried in day wear. When the grave inclusions are divided into Davidson's categories, 58% (33/57) of individuals with spiritual objects were buried in day wear, while 80% (24/30) of those buried with personal items had evidence of day wear. This finding supports Davidson's association of truly secular grave goods with greater mortuary elaboration, though there was certainly no shortage of accessories on the burial outfits of those interred with African spiritual items.

Cultural variations are evident at the Alameda-Stone Cemetery as well, where a preference for burial in day wear rather than shrouds is clear. In fact, the two burial grounds with the highest frequencies of day wear outfits – Alameda-Stone and Dove – were both utilised by communities with a Hispanic Catholic majority. As previously mentioned, framed photographs and drawings were found almost exclusively in graves at Alameda-Stone, with the only other example in this study coming from an adolescent burial at the Third Street Cemetery. It also appears that Hispanic Catholics more frequently followed the canonical tradition of crowning dead infants and children with wreaths of flowers, based on the number of sub-adults with evidence of such wreaths at Alameda-Stone (41.6%, 195/469) versus the Third Street Cemetery (10.5%, 46/439). Though it is possible that the disparity is due to preservation (i.e., that wreaths at Third Street were more often constructed from perishable materials), the persistence of the tradition of *los angelitos* in modern Hispanic communities (Ball 2003:329-330) suggests the preference may have existed in the historical period as well. The burials of two teenage girls at Alameda-Stone also yielded evidence of flower wreaths, which suggests that the principal mourners identified them as children rather than adolescents or adults. Age estimates for the two girls are 15-17 years and 14-17 years, respectively. The age of 15 is significant for females in Hispanic cultures. The tradition of the *quinceañera,* a lavish celebration of a girl's transition to womanhood on her fifteenth birthday, has roots that date to colonial times (Tatum 2014:285; Verdin and Camacho 2019). A number of 15-year-old girls are listed as married in the 1864 Arizona Territorial Census records (accessed through ancestry.com), which suggests that adulthood truly did begin at that young age for some. The presence of flower wreaths in the two graves, then, likely indicates that the occupants had not lived long enough to celebrate their *quinceañeras*.

Another variation from mainstream Euroamerican funerary practices is notable in the sample from the MCPFC, which is characterised by the general lack of mortuary elaboration typical of, though not uniformly observed in, American institutional burial grounds (Campbell *et al.* 2016; Kimmerle *et al.* 2016; see Bell 1990 for an exception). Nearly all coffin handles recovered from the MCPFC were utilitarian rather than decorative, and artefactual evidence indicates that the vast majority of the adults and infants were buried in shrouds (or perhaps nothing at all), most of them having died as residents of the institutions and/or having been anatomised prior to interment. Adolescents were more frequently buried in day wear, and two were interred with personal or religious objects. Rather than indicating esteem or sentimentality on the part of the institutional undertakers, the differential treatment of these few teenagers is more likely related to their status as non-residents. Though teenagers were mentioned among the inmates of the Poor Farm, Insane Department, and the County Hospital in an 1866 report on the institutions, their low numbers in the institutional records suggest that many of the teenagers ended up in the cemetery as unclaimed bodies buried with their possessions at the time of death or paupers buried with some familial involvement (Richards 1997:57-59, Richards *et al.* 2013:27-28). For instance, 19-year-old John M. Moran, who was struck and killed by a train two days after his release from the Wisconsin State Reformatory, was buried in the MCPFC 16 days after his death because his family lived too far away to claim his body (Richards *et al.* 2013:2-3). A newspaper article concerning the death of 17-year-old laundress

Theresa Roice, who may have perished from pneumonia, emphasised her sister's failed attempt to avoid a pauper's burial for the girl (Richards 1997:253).

10.8.4. WESTERN DIFFUSION

Like many trends throughout U.S. history, the Beautification of Death and the American coffin hardware industry were both born in the Northeast and spread westward (Goldstein and Buikstra 2004:47; Mack 2013c:75; Springate 2015: 57-63). The inexorable, though sometimes slow, expansion of infrastructure including transportation networks and the postal system gradually brought both the goods and ideas central to new funerary practices from the East Coast to the rest of the country (Springate 2015:58-59). Thus the paucity of elaborate coffin hardware observed at the Alameda-Stone Cemetery is related to its location in a remote Western outpost, beyond the reach of the railroad system, despite the fact that its active dates encompass the period when mortuary elaboration had gained popularity in the eastern half of the U.S.

Additionally, Springate (2015:59-60) attributes the spread of mortuary elaboration to the rise of the middle classes, who sought to solidify status by conforming to newly established appropriate behaviours, defined in any number of handbooks on social interaction. A westward spread of the middle class is also observable in American history, though this diffusion was not simply a matter of middle-class families relocating to the western territories. Regardless of the socioeconomic status of a family at the time of migration, settling the frontier required years of hard work and primitive living that blurred class lines (Calhoun 1918:II:170). Only gradually did homesteads and communities develop to the point that better-off residents had free time for loftier pursuits like reading and contemplation and for entertainment and social events (Riley 1988:23-24, 32, 94-95). The extended adolescence observed in America today was born of the middle classes, who could afford for their offspring to delay in contributing to family economy (Kett 1977). In the nineteenth century, while families in established communities back East began to see their children as individuals to be moulded and educated, frontier families needed every child to participate in the effort of carving out a new life (Riley 1988:52).

In the Alameda-Stone sample, adolescent burials exhibited the least amount of mortuary elaboration. None of their graves had decorative coffin hardware or personal grave goods, and teenagers were buried with religious objects with less frequency than the rest of the population. In fact, teenagers were more likely to be buried without a coffin at all. In some cases this choice was an act of Hispanic Catholic piety, but uncoffined burials performed with care would likely involve a head niche. The head niches at Alameda-Stone, which were found only in graves without coffins, were excavated into the end of the grave shaft at the base and allowed the interred individual's cranium to be protected from direct contact with soil as the grave was filled in (Heilen and Gray 2010a:239-241). Of the 14 adolescents buried without coffins, only two were found in graves with niches. While the bodies of some teenagers – like the individual buried with the reliquary or the Native American girl in the beaded dress – were clearly prepared with care, the cursory mortuary treatment of the majority of adolescents is of greater interest. Examination of the 1864 Arizona Territorial Census provides an explanation for the apparent lack of effort expended on the adolescent dead. Out of 193 individuals aged 13 to 19 years old recorded in Tucson, more than half (106/193) were listed as living somewhere other than the parental home[7]. Individuals 18 and older were living as near-adults, with 67% living away from home (45/67), 31% listed with an occupation (21/67, including soldiers), and 21% married (14/67). Even at younger ages, though, Tucson's frontier teenagers seemed to be living independently, with one third of the 13-year-olds (7/21) residing outside the nuclear family. Adolescents who lived away from home presumably died away from home as well. Given the isolated nature of settlements in Arizona at the time, the documented transportation difficulties, and the rapid onset of decomposition in warm climates, it is likely that these young people were interred in the towns where they perished. Mortuary arrangements were furnished, then, not by sentimental parents but by acquaintances or municipal authorities providing the bare minimum required for "decent" burial. In her examination of age identity in funerary contexts, Gowland (2006) emphasises the importance of material objects

7 Because these census records did not divide entries by household, residence away from the parental home was determined when no individuals with the same last name were listed on the same page or the previous or following page.

in the communication of social identity. When an individual is buried by strangers, whether in an institutional cemetery or a frontier outpost, the absence of mortuary materials reflects the lack of concern for the corpse's identity.

10.9. Conclusions

Variations in burial programmes observed in the cemeteries in this study are largely the result of temporal and regional factors, as the nineteenth century was a period of dynamic expansion and social change in the United States. Nevertheless, by accounting for these variables with a closer examination of community context, it is possible to identify elements of differential mortuary treatment accorded to teenagers similar to those seen in the Third Street Cemetery. In American graveyards where adolescent burials deviate from the established pattern of greater mortuary elaboration, one likely explanation is nonfamilial oversight of funeral preparations.

III. DISCUSSION AND CONCLUSIONS

Chapter 11

Discussion

11.1. Introduction

This thesis began with the hypothesis that the transitional life stage today referred to as adolescence involves both physiological alterations and social status shifts which should be observable in mortality patterns and mortuary treatment. The first portion of this study, which focused on a single burial population representing deaths from a time period shorter than the average adult life span (1833-1880), found these hypothesised differences detectable when multiple lines of evidence – including osteological analysis, historic records, and artefact interpretation – were considered. When the study was expanded to include evidence from 10 additional burial grounds, representing both rural and urban communities from various regions of the United States, diverse cultural groups, and a time period spanning from 1824 to 1935, the results were more complex. However, patterns which appear to contradict the original findings from the Third Street Cemetery actually provide a clearer illustration of health trends and sociocultural changes in nineteenth century America.

11.2. Adolescent Mortality Trends

Rather than examining adolescents in isolation, this study compared data from teenagers with individuals of all age classes and considered age-related differences in cause-of-death patterns in documentary sources, as well as the prevalence of selected stress and disease markers (and combinations thereof) in the skeletal remains of adolescents. As Wood *et al.* (1992:353) point out, the presence of a healed lesion indicates that an individual survived a health insult, but not whether the individual's survival was due to superior health (e.g., strong immune system) or resulted in a weakening of overall health (acquired frailty). However, "by examining the age patterns of healed and active lesions and by comparing those patterns across lesions of differing aetiologies, we can begin to link pathological changes in bone to frailty in a meaningful way" (Wood *et al.* 1992:366). Though individual skeletal markers were first considered separately, significant patterns were identified only in the analysis of groups of lesions across age classes.

11.2.1. DATA FROM DOCUMENTARY SOURCES

Though burial records from St. Raphael's Cathedral are incomplete and offer little information about the adolescent dead in the Third Street Cemetery, other historical documents, such as the sexton's reports for the Dubuque City Cemetery, provide ample details about death in the community at large. A calculation of death rates by age class using census data and City Cemetery records from the same 12-month period (1859-1860) found that the adolescent death rate of 20 per 1,000 was not significantly lower than that of adults (27/1,000) or children (25/1,000). This finding contradicts the common wisdom that adolescents typically constitute a small portion of cemetery populations based on their hardiness and the lower likelihood of death at that age. The reported scarcity of adolescents in skeletal collections may, in fact, be heightened due to observational factors, including the short, highly variable span of years assigned to the age class; the inconsistent classification of the beginning of adulthood (sometimes as young as 16 years); and the failure to recognise older sub-adults when long bone epiphyses are not preserved and third molar development cannot be observed. Contrary to the assumption that death rates would decline in late childhood and adolescence, crude tallies of deaths by two-year age brackets, spanning 20 years of City Cemetery records, show a steady increase in the numbers of deaths from the lowest point at 13 to 14 years continuing into young adulthood (Figure 11.1). Though demographic non-stationarity cannot be accounted for, these numbers potentially support the hypothesis of decreased immune function in later puberty. Anecdotal evidence is suggestive of adolescent susceptibility, as well. Out of four autobiographies which describe the lives of teenagers in nineteenth-century Dubuque and its surroundings, three include episodes of life-threatening illness in adolescence (Conzett 1900; Hobbs 1974; Hoffman 1936; Rittenhouse 1880).

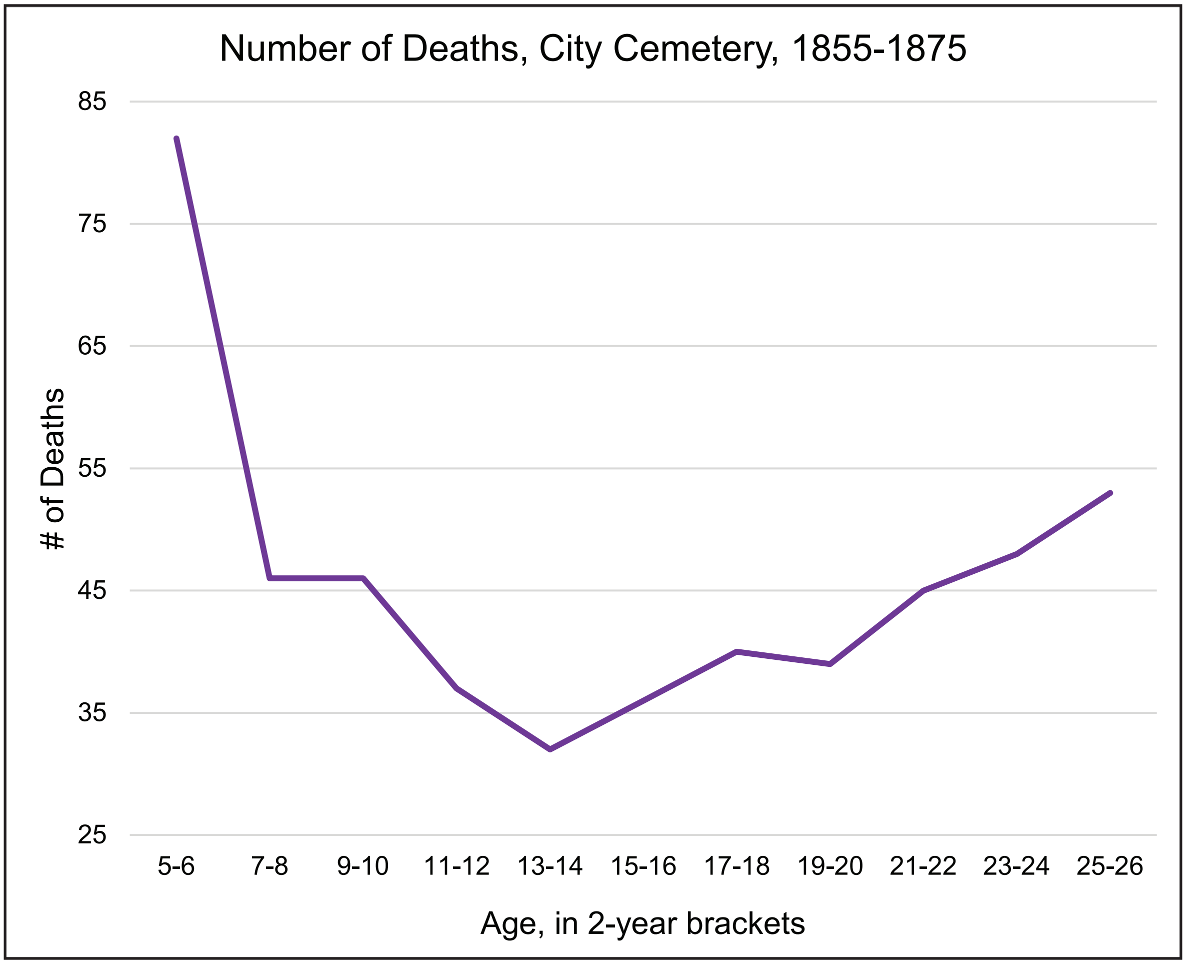

Figure 11.1. Graph showing the numbers of deaths reported in the Dubuque City Cemetery records (1855-1875) for children, adolescents, and young adults, with ages grouped in two-year brackets.

Presumably referring to the Western world, Aufderheide and Rodriguez-Martin (1998:130) state that tuberculosis had become the most common cause of death by single disease by the early nineteenth century. The high rate of death from TB documented in the Mortality Schedules and City Cemetery records for the overall population of Dubuque, then, was expected. Given the hormonal changes that allow adult-type pulmonary TB to develop in puberty, the prevalence of consumption and other tuberculous conditions among teenagers is also unsurprising. TB was the most commonly recorded cause of death for adolescents and adults alike, accounting for 28.5% (35/23) of teen deaths and 21.8% (225/1031) of adult deaths in the City Cemetery records (1855-1875). After TB, the two most prevalent medical causes of death for teenagers were typhoid fever (11.4%, 14/123) and meningitis (8.1%, 10/123). Though neither of these conditions is commonly associated with bony reaction, both have the potential to affect the skeleton, especially in adolescence, and therefore are potentially detectable in the Third Street Cemetery remains as well as other cemetery collections.

Though complete records are not available for the MCPFC or Freedman Cemetery, high rates of TB are documented in both communities (Peter *et al.* 2000:142; Richards *et al*. 2016:31), and scant funeral home records from Dallas indicate high mortality from the disease among teenagers (Davidson 2004a:799-820). Burial records from the Campo Santo de San Fernando in San Antonio, Texas, on the other hand, report only a small fraction of adult deaths (4.3%, 33/772) and none of the adolescent deaths as due to TB (Leal 1975). The top two medical causes of death listed for the population are “fever” (23.7%, 300/1,265) and “pain” (12%, 152/1,265), nonspecific descriptions that likely applied to a number of illnesses, which local histories suggest included yellow fever, dengue fever, and malaria (Burns 2010; Corner 1890). Interestingly, cholera is mentioned in only one case at Campo Santo, though an epidemic is known to have swept through town during the active period of the cemetery (1808-1860). The significance of these four diseases is twofold. They are all warm-climate diseases which can exist in short-term epidemic form in continental climates, but which became endemic to the southern United States (Bukkuri 2016; Burns 2010; Duffy 1968; Supervising Surgeon-General 1899). With the exception of malaria, which can indirectly lead to cribrotic or scorbutic lesions in children, these maladies leave no evidence on the skeleton (Lewis 2018a:198; Halcrow *et al.* 2014; Prentice *et al.* 2007; Rivera and Lahr 2017).

Prior to the end of the nineteenth century, these tropical diseases exacted a significant toll in the southern United States, particularly in coastal and wetland areas with large mosquito populations, as yellow fever, dengue fever, and malaria are all mosquito-borne diseases. Though the spread was worst in the “sickly season” of summer and autumn and subsided in the winter months across most of the South, the diseases returned annually in these states, unlike in northern port cities where summer reintroduction occurred via sailing vessels (Bukkuri 2016; Duffy 1968). Mild southern winters permitted the survival of the *Anopheles quadrimaculatus* and *Aedes aegypti* mosquitos which spread malaria, dengue, and yellow fever, as well as the bacterium *Vibrio cholerae*, which causes cholera and which cannot survive when water temperatures remain below 5°C for extended periods of time (Bukkuri 2016:83-84; Duffy 1968:688; Huq *et al.* 1984:423). Though typhoid is often considered a tropical fever, the causative bacterium, *Salmonella typhi*, can survive in cold water, or even ice, for several weeks (Kaye 2010:i; USEPA 2009). The disease caused deaths year-round in Midwestern cities like Dubuque, and death rarely occurred less than two weeks after the appearance of symptoms, thus distinguishing typhoid from quick-killing tropical diseases like yellow fever (Vincent and Muratet 1917:20; Supervising Surgeon-General 1899).

In the city of New Orleans alone, yellow fever killed between 8,000 and 9,000 people in 1853, and likely sickened one third to one half of the population (Duffy 1968:689). That same year, 60% of the population of Galveston, Texas (ca. 5,000), became sick with yellow fever and 523 residents died (Burns 2010). Dengue fever was not as often fatal, but outbreaks often co-occurred with yellow fever (Supervising Surgeon-General 1899:300). Meanwhile, malaria was so common in the South that its seasonal spikes were used strategically against the Union army during the Civil War (Bukkuri 2016:84). Cholera killed over 500 residents of San Antonio in 1849, and the last major outbreak of yellow fever occurred there in 1903 (Burns 2010). The prevalence of these diseases in warm-climate states in the nineteenth century directly affected the proportional mortality observed in the comparative cemeteries. That is to say, chronic diseases that leave skeletal evidence (such as TB) can be expected to have lower representation in cemetery populations from communities/regions with a documented high prevalence of competing, quick-killing causes of death like yellow fever and cholera. Though the area of Tucson, Arizona, is mapped as having a semi-arid climate, irrigated agricultural fields and marshes near the town provided ample habitat for mosquitos. Nineteenth-century military hospital records list fevers and “malarial fevers” as the most common health complaints and as cause of death for a number of individuals buried in the military section of the Alameda-Stone Cemetery (Heilen and Gray 2010a:169). Respiratory diseases like TB were less commonly reported in the available hospital records, but more often killed affected individuals (Heilen and Gray 2010a:169-170), thus explaining the skeletal evidence of TB found in the Alameda-Stone sample, despite the prevalence of tropical fevers in the area.

Though regional generalisations can be made, community-specific documentation of prevalent diseases is preferable when trying to tease out osteological evidence of competing causes of death in historic cemeteries.

11.2.2. SKELETAL MARKERS OF EARLY-LIFE POOR NUTRITION AND DISEASE

Linear enamel hypoplasias (LEH) of the anterior teeth reflect health insults occurring before the age of 6.5 years, while cribra orbitalia and porotic hyperostosis lesions (CO/PH) appear only before the cranial vault transitions from red marrow to yellow, at around 11 – or as late as 15 – years. Thus, LEH and CO/PH both represent poor nutrition and/or disease episodes in infancy or childhood. At the Third Street Cemetery and in other early populations in this study, adolescents (non-survivors) and adults (survivors) tend to exhibit equal frequencies of LEH, while in later samples, non-surviving adolescents have a higher prevalence. The opposite trend is seen with CO/PH, which is more prevalent in children and adolescents in the first half of the nineteenth century, but equally present in all age groups, including adults (healed lesions), in the second half of the century.

Though both LEH and CO/PH have been linked to nutritional deficiencies, it is likely that these skeletal manifestations are often related to malnutrition secondary to disease. Evidence suggests that LEH formation is associated with vasoconstriction – the preferential directing of blood to vital tissues during periods of stress – which supports the nutritional origin of defects (Temple 2018:240). CO and PH have long been linked to anaemia. Dietary iron deficiency anaemia (IDA) or megaloblastic anaemia brought on by B_{12} or folic acid deficiency may be indicated in cases with diploic expansion due to increased hematopoiesis, but lesions associated with diploic atrophy are more likely related to anaemia of chronic disease (Grauer 2019:515; Rivera and Lahr 2017; Walker *et al.* 2009). Additionally, while IDA and B_{12} deficiency can be linked to dietary access, they, like the general undernutrition causing LEH, can also be associated with any protracted illness which interferes with a child's ability to eat or digest food and absorb nutrients (such as chronic diarrhoea) and with cultural practices which include a monotonous or restricted diet for convalescents (Grauer 2019:517; McDade 2003:104).

Distinguishing between LEH caused by mild undernutrition due to resource access issues – particularly on the most vulnerable and plastic portions of the crowns – and those caused by malnutrition secondary to serious illness is not possible at the individual level when considering only LEH observed macroscopically and in the absence of other pathological markers. The episodes producing LEH may or may not be severe enough to require an energy investment "trade-off" that would affect later growth, health, or development (Goodman *et al.* 1991; Temple 2014). Likewise, the severity or duration of the condition causing CO or PH in an individual cannot be determined from the severity of the skeletal lesion (Grauer 2019:517). At the population level, however, distribution patterns can offer greater insight. The patterns seen at Third Street and the comparative cemeteries suggest improvements in overall health and survival of young children as the century progressed. In the first half of the nineteenth century, more children died with active CO and PH lesions. The healthier children who managed to survive health and nutritional insults became adolescents, many of whom had LEH. During this period, adolescents with LEH were equally likely to die as youths or to survive into adulthood, based on the equivalent LEH rates for both age groups. In the later part of the century, more children were able to survive serious disease, resulting in the apparent broader age distribution of healed CO/PH lesions. The fact that LEH were more prevalent among adolescent non-survivors than adults in this period lends support to the hypothesis that individuals who persist through grave illness in infancy and early childhood are more vulnerable to disease in adolescence, an idea that is discussed further below. Of course, this supposition hinges on the assumption that the adult skeletons in a given cemetery represent individuals from the same cohorts as the sub-adults or that they represent individuals who grew up under similar conditions in the U.S. or Western Europe. The scenario of gradual improvements in early-life health is bolstered by a documented decline in infant and child mortality in the U.S. population at large in the late nineteenth and early twentieth centuries (Lee 2007).

11.2.3. ADDITIONAL DISEASE MARKERS: ENDOCRANIAL LESIONS AND PERIOSTEAL NEW BONE FORMATION

Two additional disease markers examined in this study – labyrinthine endocranial lesions and nonfocal periosteal new bone formation – can occur at any point in life and, if active at the time of death, may indicate that disease contributed to cause of death. Findings concerning the individual markers highlighted issues surrounding observations of skeletal lesions. Labyrinthine endocranial lesions were not observed (or even looked for) in several of the populations. Where observed, these lesions were found, as other researchers have noted, more frequently in sub-adults than adults, likely due to the fact that paediatric bone is more vascular and reacts more readily to the inflammatory or traumatic stimuli which cause the production of endocranial new bone (Lewis 2004; Schultz 2001). However, this plasticity may not explain the relatively high prevalence among adolescents, whose cranial bone reactivity is more similar to that of adults. Inflammation of the meninges is one aetiology commonly ascribed to these lesions. In modern America, bacterial meningitis occurs most frequently in teenagers and young adults, a tendency which is attributed both to increased social interaction and age-related changes to the microbiome of the nasopharynx (Catenazzi *et al.* 2014). Though meningitis caused by *Neisseria meningitidis* often kills patients too rapidly for bony reaction, less virulent bacterial meningitis secondary to other conditions (typhoid fever, pneumonia, etc.) and chronic leptomeningitis associated with TB may result in endocranial lesions (Hershkovitz *et al.* 2002; Lewis 2018a:144). Another commonly proposed aetiology for endocranial lesions is subdural haematoma, the chronic form of which was reported in twentieth-century Iowa to be more common in adolescents and young adults (Rahme and Green 1961). Records from the Dubuque City Cemetery (1855-1875) showed that meningitis and traumatic accidents were the fourth and fifth most common causes of death for adolescents, accounting for 8.1% (10/123) and 7.3% (9/123) of recorded teenage deaths, respectively.

Calculations of the prevalence of periosteal new bone formation was complicated by the use of non-experts for the original osteological analysis of two burial populations. Lewis (2018:4,144-145) has pointed out that woven bone deposited during normal growth in infants and individuals under four years can be mistaken for pathological bone formation. Additionally, the author has observed adhering soil, taphonomic damage, and the natural striae of older adult tibiae misidentified as “periostitis.” Well-preserved adolescent long bones are less likely to be misclassified as pathological. However, even reliable observations of nonfocal periosteal new bone formation are not pathognomonic, as this bone growth can occur in individuals with any number of systemic diseases or nutritional deficiencies. According to the Dubuque City Cemetery records (1855-1875), typhoid fever was the second most common medical cause of death for teenagers in Dubuque. The disease was also considered a significant public health issue in nineteenth-century Dallas, the location of Freedman Cemetery. As osseous involvement in typhoid fever during the pre-antibiotic era was noted primarily in young individuals whose long bones were still growing, typhoid is considered a likely contributor to the prevalence of periostosis among adolescents in the study samples (Vincent and Muratet 1917:75). Two lesser contributors are likely scurvy and pellagra. Periosteal new bone formation on the facial bones, sphenoid, and distal tibiae may be due to haemorrhage and calcification related to scurvy (Lewis 2018a:214-215). Healed scorbutic lesions observed on adolescents at Third Street – or other cemeteries with large Irish immigrant populations – could indicate that an individual survived the Great Famine (1845-1849), as scurvy was not common in Iowa. Pellagra, which was prevalent in the southeastern United States in the late nineteenth and early twentieth centuries, presents with periosteal lesions similar to those seen in scurvy, with a predilection for the lower leg bones (Paine and Brenton 2006). This condition may explain some of the periosteal bone formation seen in adolescents from the southern cemetery samples.

11.2.4. TUBERCULOSIS

Pathognomonic TB lesions were extremely rare in the skeletal sample, an expected finding, as TB affects the bones in only 1% to 5% of modern clinical cases (Roberts and Buikstra 2003:89), with 12% reported for sub-adults from an early twentieth-century sanatorium (Roberts and Bernard 2015). Subtle bone involvement *not* reported in clinical studies – periosteal new bone growth on the pleural rib surfaces – was observed on a number of individuals in the current study sample, including four adolescents, suggesting either TB or another chronic pulmonary condition such as pneumonia or bronchitis. Given the documented toll TB took on the adolescent population in Dubuque (28.5%, 35/123 deaths reported for City Cemetery) and the overall population of the Milwaukee County Poor Farm Cemetery [MCPFC] (Richards *et al*. 2016:31), the paucity of rib lesions is surprising, particularly since Santos and Roberts (2001) report finding such lesions on 90% of juveniles (7-21 years old) with documented TB in an anatomical collection in Portugal. Imperfect preservation of ribs in archaeological samples may explain the lack of evidence, but only partially. As the overall rate of TB infections was high in Dallas (Peter *et al.* 2000:142), and funeral records indicate high proportional mortality among teenagers (Davidson 2004a:799-820), the absence of evidence in adolescent skeletons from Freedman may be explained by heredity. Medical studies have demonstrated greater susceptibility to TB in individuals of African ancestry, and this lesser immune resistance may have led to more rapid deaths, particularly among the young and vulnerable, which left no signs of chronic disease on the skeleton (Roberts and Buikstra 2003:19-20, 50-51).

Despite the general belief that adolescents are more resistant to disease than younger children due to the maturity of their immune systems, evidence suggests that hormonal changes occurring in puberty in fact leave teenagers more vulnerable to infectious diseases, particularly TB (Lewis 2018:6). While children's bodies must balance demands for energy investment in growth and immune function, and adult bodies keep balance between reproduction and immunity, adolescent systems are taxed by energy demands both from the pubertal growth spurt and from reproductive development, as well as immune function (McDade 2003). Clinical studies have suggested these competing demands can result in trade-offs leading to increased immune vulnerability, particularly in high-pathogen and/or low resource environments (McDade 2003:117-118). This proposed pubertal decline in immune function coincides with developments that allow the occurrence of adult-type pulmonary TB. Upon reaching puberty, the immune system shifts from a strategy of simple containment of tuberculosis bacilli to destructive containment. The resulting tissue necrosis creates a higher-oxygen environment in the lung apices, which in turn encourages multiplication of *M. tuberculosis* (Marais *et al.* 2005). These circumstances lead to vigorous growth of the bacilli at a point in the human life cycle when immune response is potentially weakened by other energy investment demands.

The urban populations included in the current bioarchaeological study certainly qualify as high-pathogen communities. Though the availability of resources would have varied between neighbourhoods and families, Dubuque death records and anecdotal evidence indicate that deaths from TB were not restricted to any particular socioeconomic group. Thus, with TB rampant in the community at large and more likely to be fatal in immune-vulnerable adolescents, one would reasonably expect to find skeletal markers of TB in non-surviving teenagers from Dubuque and other urban samples. The lack of pathognomonic lesions and paucity of general pulmonary disease lesions requires the consideration of indirect skeletal evidence of TB.

Primary TB often occurs in childhood, followed by quick death or recovery (Roberts 2012). Two pathways connect primary TB to the early-life stress markers discussed above. Malnutrition compromises the immune system, leaving a child who already has nutrition-related LEH or CO/PH more vulnerable to tubercular infection (Buikstra and Roberts 2003:55; Jaganath and Mupere 2012). Meanwhile, Fischer (1898) included loss of appetite, digestive disturbances, and weight loss in his list of common symptoms of infantile and childhood TB. These symptoms could easily lead to nutritional deficiencies which would be manifested in LEH, CO, or PH. In a small skeletal sample from a prehistoric population in Illinois, Knick (1981) found a correlation between LEH formed in the first seven years of life and the occurrence of TB lesions in young adulthood, which he interpreted as dental evidence of a survived primary TB infection. Rivera and Lahr (2017) conclude that the most common cause of CO accompanied by diploic atrophy (rather than diploic expansion and PH) is likely anaemia of chronic disease, which occurs in TB (as well as typhoid). Lovász *et al.* (2010) tentatively identified an association between CO and "early-stage" TB markers, particularly endocranial lesions, in individuals under 10 years. Hershkovitz *et al.* (2002) explored the connection between labyrinthine endocranial lesions and TB or other intrathoracic pathologies. Having dismissed tuberculous meningitis as a common cause due to its rapid onset and death, they hypothesised that systemic septicaemia could result in both subperiosteal haemorrhages leading to appositional bone growth on long bones and epidural haemorrhages leading to endocranial lesions. Thus, LEH, CO, and PH observed in older children, adolescents, and adults can potentially be considered evidence of survival of primary TB, while active endocranial lesions and periosteal new bone formation on long bones may be associated with post-primary TB around the time of death, especially when identified alongside pathognomonic lesions of the spine or pelvis or periosteal new bone formation of the pleural rib surfaces.

11.2.5. EARLY-LIFE STRESS AND LATER DISEASE SUSCEPTIBILITY (ACQUIRED FRAILTY)

Hidden heterogeneity of frailty is one of the fundamental issues raised in the original discussion of the osteological paradox (Wood *et al.* 1992). Because the current study focuses on adolescents who have survived infancy and childhood in communities with high selective mortality, some sources of differential mortality risk can be cautiously disregarded, such as heritable frailty specific to families, congenital frailty related to acute maternal health issues, and cultural differences in child-rearing and weaning practices. Differential exposure to infectious disease due to small-scale geography (neighbourhoods) cannot be explored with the data available, though one can reasonably assume that adolescents entering the workforce would increase the number of persons with whom they had contact, and thus increase opportunities for pathogen transmission. As socioeconomic status cannot be determined from mortuary treatment, differential access to nutrition and medical treatment cannot be investigated, though adolescents from very poor families potentially improved their own health by starting work and supplementing the family income (Gowland and Newman 2018:317). The two key sources of heterogeneity among the non-survivor teenagers explored in this study are acquired frailty – a decreased resistance to stressors resulting from cumulative declines of physiologic systems due to past stress (Marklein *et al.* 2016:210) – and differential exposure to risks related to occupation and daily habits (discussed in Section 11.2.6).

To evaluate the effect of acquired frailty at different points in the life cycle for each sample population, the numbers of individuals of each age class with skeletal markers from the early-life group and the additional disease category were tallied. As previously established, the early-life markers reflect health insults occurring before the age of around 11 years. The additional pathological markers reflect chronic recent or perimortem disease, whether the lesions are related directly to cause of death, or the lesion-causing disease is simply indicative of a weakened immune system that left the individual vulnerable to a separate, fast-killing disease (Wood *et al.* 1992:349). The results from the Third Street Cemetery were striking; 26.3% (10/38) of observable adolescents presented with evidence of both early-life stress and recent chronic disease, while only 8.3% (19/228) of adults did, a difference found to be statistically significant. Only around 4.5% of infants and children were found with both types of pathology, but these figures are not truly comparable, as most of these younger individuals did not experience the full window for accumulation of early-life markers. Of those who succumbed after the age of 12, adolescents (non-survivors) with a history of health insults appear to have been more susceptible to chronic disease than adults (survivors), who exhibited the same prevalence of LEH as adolescents, but not in combination with other disease markers. Though pubertal stage could not be determined for all 10 adolescents with early-life pathology markers and later disease, the majority (83.3%, 5/6) were found to be post-PHV, in the deceleration or maturation stage.

Due to limitations in the available data, this analysis could be applied to only five of the comparative cemetery populations *in toto*. The remaining three burial grounds – which comprised the three largest populations – contributed comparable data for the adolescent age group only. Definitive conclusions cannot be drawn from this combined, non-random sample, though a statistically significant difference was found between the prevalence rates for adolescents and adults, suggesting the same pattern of vulnerability to chronic disease in adolescence due to acquired frailty. When only the five smaller populations were considered, no significant difference was detected between adolescents (1/23) and adults (5/178) with both early-life and perimortem skeletal markers of nutritional stress and disease. However, within this smaller group, a comparison of adolescents and adults with early-life markers (LEH, CO, and PH) proved useful. The significantly higher rate for adolescents (47.8%, 11/23) over adults (26.4%, 47/178) demonstrates again a tendency for individuals with acquired frailty to die before adulthood, regardless of whether or not the individuals also present skeletal evidence of chronic disease ($\chi^2=4.553$, df=1, $p=0.033$).

Given the Irish heritage of much of the parish and the use of the Third Street Cemetery in the decades following the Great Famine (1845-1849), hidden heterogeneity of acquired frailty related to this historical event must also be considered. An increased risk of mortality could arise from epigenetic programming during foetal development stimulated by severe maternal stress as proposed by the Developmental Origins of Health and Disease hypothesis (DOHaD) (Gowland 2015). This maternal stress might be detected by the presence of LEH on deciduous anterior teeth. Meanwhile, individuals who were infants or young children during the famine might have experienced severe malnutrition or disease, resulting in ineffective allocation of energy resources towards maintenance (immunity) in the future, according to the plasticity/constraint hypothesis (Charnov 1991). Children with deficiencies of protein or certain micronutrients (vitamin A and zinc) are less able to mount efficient immune response, particularly to TB (Jaganath and Mupere 2012). Childhood survival of the famine could result in LEH of the permanent teeth, CO, or PH. The health of any teenager buried at Third Street between 1846 and 1868, then, could potentially have been affected by acute stress caused by this mass disaster (Belsky *et al.* 2015). If they survived into adulthood, females affected *in utero* could have passed to their own children adaptations related to this ancestral adversity (Gowland 2015). Interestingly, Preston and Haines (1991:107) note exceptionally high mortality among first- and second-generation Irish immigrants in America, even at the end of the nineteenth century, though they attribute this toll to the shift from a rural setting to urban living.

Whether early-life stress occurring in utero and early infancy altered health outcomes through predictive-adaptive response (DOHaD) (Armelagos *et al.* 2009; Cook and Buikstra 1979) or stress and illness in infancy and childhood increased immune vulnerability through cumulative physiologic declines and future energy investment trade-offs (Marklein *et al.* 2016; Temple 2014), children entering puberty with increased susceptibility to disease were further weakened by their own development. The competing demands of the pubertal growth spurt, development of the reproductive system, and immune function can result in a deficit in immunity, particularly in high pathogen environments and particularly in the deceleration and maturation stages of puberty (McDade 2003:117-118). Clinical evidence for this immune vulnerability is seen in reduced vaccine responsiveness and reduced production of thymopoietin (a hormone involved in cell-mediated immunity) in adolescents with a history of poor pre- and post-natal nutrition (McDade 2012:17282). Another study found evidence of a connection between foetal or early post-natal undernutrition and increased mortality risk from infectious disease in adolescents and young adults in rural Africa (Moore et al. 1999). The results of the current research lend further support to the theory. Adolescents from Third Street exhibited a higher prevalence of recent or perimortem chronic disease than any of the other age groups. Furthermore, all of these chronically ill teenagers also displayed evidence of early-life stress. This pattern suggests that individuals already compromised by survival of disease and/or nutritional stress in early childhood faced increased mortality risk in puberty, with a decrease in risk after reaching adulthood, as expected given the central role of the immune-competent, procreative young adult in species survival (Simon *et al.* 2015). The same pattern was seen in the non-random sample of adolescents from the comparative cemetery populations. Though evidence of perimortem chronic disease in teenagers was lacking in the all-ages sample from the five smaller burial grounds, the higher prevalence of early-life stress markers among these adolescents again demonstrates the increased mortality risk in puberty for individuals with acquired frailty. The difference in the "signal" seen in these adolescent skeletons – early-life stress markers, but no evidence of recent chronic disease – likely relates to cause of death. In communities where quick-killing pathogens were more common, vulnerable teenagers would have succumbed without any perimortem skeletal involvement.

As the type and severity of early-life stress likely determines whether or not an individual will experience long-term health effects, and as chronic disease of sufficient length is required for manifestation of additional skeletal markers, the best explanation for the strong "double signal" (both types of markers) in the Third Street population is the prevalence of TB in the community. The biphasic nature of the disease, which provides no increased immunity in those previously infected, and its differential manifestation in sub-adult versus pubertal and post-pubertal individuals (Marais *et al.* 2005) corresponds with the observed double signal, as discussed in Section 11.2.4. Although a combination of early-life and additional skeletal pathology markers would certainly not occur exclusively in cases of TB, it is more likely to be common in populations where TB is prevalent rather than in communities where acute diseases such as yellow fever and cholera take a heavy toll.

11.2.6. ADOLESCENT ACCIDENTS AND VIOLENCE: HISTORICAL AND SKELETAL EVIDENCE

Accidents and violence are the leading causes of premature death for adolescents and young adults in modern America, accounting for up to 72% of mortality for that age group (Miniño 2010; Walker 2001:573). While the proportion of non-medical deaths among adolescents in the Dubuque City Cemetery records did not reach the extremes of the modern data, accidents were the second most common cause of death (23/123), just after TB (35/123). Adding in the single teenage suicide, external causes accounted for 19.5% (24/123) of adolescent deaths, a figure significantly higher than that for adults, 11.8% (122/1,031). With this prevalence in the Dubuque community, one might expect to see evidence of perimortem trauma among the teenagers buried at Third Street. However, given that drowning – which does not affect bones – was reported as the primary cause of accidental death for adolescents (60.9%, 14/23), the absence of observed trauma is less surprising.

Perimortem trauma was not common among adolescent skeletons from any of the comparative cemetery samples, either, though four out of the eight burial grounds provided some examples (n=7). Two adolescents from Alameda-Stone (one male, one female) suffered perimortem skull fractures, while another male apparently perished in a fire. Though the teenage boy from Freedman Cemetery found with birdshot pellets in his facial bones might have been classified as a death due to violence, identification of the individual as 14-year-old Oscar Eapham, who unintentionally shot himself in the face, places this case in the accidental death category. The final accidental case is the older adolescent male from the MCPFC, who suffered multiple perimortem fractures due to some type of high-energy impact, possibly a train accident. These five accidental deaths (4.5%, 5/110) slightly exceed expectations based on the Dubuque City Cemetery records, which report at least 3.3% (4/123) of adolescent deaths as due to accidents resulting in perimortem skeletal trauma, excluding drownings and unspecified accidents. However, the numbers fall short of the 8% (4/50) of adolescent deaths due to accident in the Campo Santo records.

Previous research on skeletal remains recovered from the original excavation of the MCPFC (1991-1992) also noted a lower than expected rate of perimortem trauma among younger individuals (Dougherty 2011). Though this study of 985 skeletons excluded all sub-adults, it is telling that middle adults (35-50 years) comprise almost two-thirds (26/40) of injury-related death cases with age estimates, followed by old adults (50+years, 8/40), and finally young adults (20-35 years, 6/40). The proposed explanations for the lack of trauma among younger individuals are poor preservation, which can render perimortem fractures unrecognisable, and "invisible" trauma from deaths due to soft-tissue injury, drowning, smoke-inhalation, etc. (Dougherty 2011:203-204).

A review of available death certificates from the MCPFC covering the years 1882-1925 found that 11.6% (795/6,866) of deaths with cause reported were due to external causes (Richards *et al.* 2016:29-31). Adolescents (13-18 years, n=60) had the highest rate of death due to accidents, and some had committed suicide. However, of the 99 murdered individuals (1.4% of deaths with cause listed), not one was a teenager. This finding is consistent with burial records from Dubuque, but not the Campo Santo burial records or the scant adolescent funeral bills from the G.W. Loudermilk day books (Dallas, Texas). Of the 15 adolescents listed in the Loudermilk records (1902-1907) with cause of death, two were murdered (13.3%), including a young woman who was stabbed and a young man who was shot (Davidson 2004a:799-820). Yet no such perimortem wounds were found among the adolescent skeletons at Freedman Cemetery in Dallas, despite ample evidence of violent death in the adult portion of the burial population. As with Dougherty's (2011) study, poor preservation and soft-tissue injuries may be responsible for the lack of observed trauma. Interpersonal violence accounted for 16% (8/50) of the adolescent deaths in the Campo Santo records. The bias towards reporting noteworthy causes of death in church records is discussed in Chapter 8, yet the listing of *any* violent teenage deaths – as opposed to the total absence in records from Dubuque and Milwaukee County – is significant. For most of the nineteenth century, the sociopolitical instability of the region including former Mexican territories (e.g., Texas, New Mexico, Arizona) gave rise to a lawlessness that led to violence by and against even those on the threshold of adulthood (Heilen and Gray 2010a:287-288; McKanna 1997:3-5). One of only two adolescents in this study's skeletal sample with evidence of violent death was buried at the Alameda-Stone Cemetery, a young man (Burial 3417-2) with an apparent arrow wound resulting from conflict with displaced Native Americans. The other murdered teen found in the comparative sample is the 15- to 20-year-old girl (Burial 33) from Grafton Cemetery, who was shot twice under circumstances that were likely personal or criminally motivated rather than related to larger conflict, as Grafton was not located in a frontier region.

That males were the main adolescent victims of accidents and violence is clear from the scant skeletal evidence as well as the historical records. Five of the adolescents with evidence of perimortem trauma were male, while only two were female. The Dubuque City Cemetery records list 23 males and only one female teen with external cause of death, while the Campo Santo records list nine males and three females. Aside from Dubuque, where no documentary evidence of employment-related teen fatalities was found, the higher rate of accidents among males could be associated with youth entry into the workplace, often in the lowest positions, as Murphy *et al.* (2019) concluded in their study of mortality among teenage Irish workers in Massachusetts. However, death records from Dubuque and other cities (e.g. Philadelphia, see Lane 1979) suggest that stereotypical adolescent male recklessness played a role, particularly in cases of death by drowning. Modern neuroscientific research has revealed that adolescent neurodevelopment is dynamic and influenced by social exposures. Teen decision-making is affected by peers, and in young men, this influence, in addition to developmental immaturity, encourages risk-taking behaviour. Additionally, adolescent impulsivity, especially in combination with low educational attainment and low socioeconomic status, can lead to violent behaviour in teenagers (Reavley *et al.* 2017), circumstances which are relevant to this study based on Lane's (1979:71-72) finding that teenage murders were often perpetrated by other teens. Essentially, the elevated risk of mortality due to occupation and/or poor decision-making constitutes another form of frailty, one that affected adolescent males more than adolescent females.

11.2.7. SEX, PROPORTIONAL MORTALITY, AND SOCIAL ADOLESCENCE

While the Dubuque City Cemetery records show far more adolescent males dying from external causes (95.8%, 23/24), females constituted the majority (60%, 21/35) of adolescents who succumbed to TB. A higher infection rate for young females is supported by both clinical and bioarchaeological findings (Roberts and Buikstra

2003:46; Shapland *et al.* 2015), though it was suggested in Chapter 7 that the greater proportion of girls in the Dubuque adolescent population (58.6% in 1860, 941/1,604) may have skewed the TB mortality profile. However, the overall even proportions of adolescent deaths in these burial records – 61 females and 61 males out of 122 teenagers with sex and cause of death reported – suggests perhaps that the bodies of boys living out of town were often returned home for burial. Alternatively, it is possible that teenage males living in Dubuque were dying at a slightly higher rate than females, as they accounted for 50% of the City Cemetery dead, but only between 41.4% of the adolescent population of Dubuque in 1860 and 45.4% in 1880 (Mack and Clarke 2020). It is unclear to what extent the apparent sex bias in common cause of death is related to pubertal immune vulnerability in females and impulsive behaviour in males. For each individual, mortality risk likely hinged on a complex relationship of biological and social factors, as the greater independence that accompanied social adolescence potentially increased exposure to communicable diseases and hazards through wider social interaction, employment, and travel.

11.2.8. THE MIDWESTERN MODEL FOR ADOLESCENT MORTALITY, THEN AND NOW

The Midwestern Model for adolescent mortality proposed at the end of Chapter 7 (Table 7.22) predicts the numbers of observable cases of chronic disease and perimortem trauma among teenagers in nineteenth-century skeletal samples in the U.S. Note that these predictions reflect proportional mortality among the dead and are not a reflection of the prevalence of disease and trauma among the living. However, the extent to which samples from various regions conform with expected numbers has the potential to identify similarities or differences in disease loads and social stability, which would affect not only the adolescent dead but the entire population.

Unfortunately, sample sizes from the individual comparative cemeteries in this study were too small for statistical analyses. Pooled samples – both excluding and including the Third Street Cemetery population – exhibited observable disease and trauma rates that were consistent with expectations, based on chi-square goodness of fit tests. These results constitute an "averaging" that does not reflect the historically documented differences between communities discussed earlier in this chapter and in Chapter 8. On the other hand, these nationwide results are more directly comparable to modern American data concerning adolescent mortality, which do not generally distinguish between northern and southern states or urban and rural settings.

Clearly, the advent of antibiotics and other advances in medicine have drastically reduced the number of adolescents dying from disease in modern America. The pubertal decrease in immune function proposed by the energy investment trade-off hypothesis is not evident in the U.S. population today due to the relatively low pathogen, high resource environment (McDade 2003:118). TB and typhoid fever, once the top two medical causes of teenage deaths, are not even mentioned in articles concerning contemporary American teen mortality. In a study of 15- to 24-year-olds covering the years 1950 to 1993, only two infectious diseases appeared in the top-ten list of most common causes, HIV/AIDS (sixth) and influenza/pneumonia (eighth). Noncommunicable diseases – cancer and heart disease – were a distant fourth and fifth most common causes, falling well behind accidents (ca. 50% of deaths), homicide, and suicide (Singh and Yu 1996). A study of 12- to 19-year-olds from 1999 to 2006 also listed accidents (48%), homicide (13%), and suicide (11%) as leading causes of death, with cancer (6%) and heart disease (3%) trailing, and no mention of infectious disease (Miniño 2010). Drug overdoses are included in these numbers as accidental deaths or suicides, or very rarely homicides. Since detailed studies predate the current opioid crisis, it is unknown to what extent the rise in overdoses would affect these figures; in 2015, 772 Americans aged 15 to 19 years old died of reported overdoses (Curtin *et al.* 2017).

External causes are responsible for approximately 72% of American teen deaths in the early twenty-first century, but the proportion of these that would result in skeletally observable trauma (data comparable to that of bioarchaeological collections) has not been reported. A smaller sample study (n=537) from South Carolina more closely examined external causes of death for individuals aged 10 to 19 years for the period from 1989 to 2003 (Batalis and Collins 2005). In the accident category, 21% of deaths were due to drowning and 12% due to toxicity (poisoning/overdose), which means that only the remaining 67% of accidental deaths (due to traffic accidents, firearms, and other causes) would result in skeletally observable perimortem trauma. Eighty-two percent of teen homicides are executed with firearms, and the 7% from blunt force trauma are also likely to be visible in a skeletal sample. The remaining 11% due to sharp force trauma and asphyxia, however, would less likely be detectable in archaeological remains. Firearms are also the preferred method for suicide (73%), but the remaining cases might not be observable, as non-judicial hanging (15%) is unlikely to affect the hyoid or vertebrae, drug overdoses and soft-tissue wounds do not affect the bones, and trauma from falls or intentional impact with moving vehicles is indistinguishable from that of accidents (Batalis and Collins 2005). If these proportions are projected onto the national data, one might expect 32% of recent adolescent skeletons to present with evidence of perimortem trauma due to accidents, 12% with evidence of homicide, and 8% with evidence of suicide. This total of 52% constitutes a vast increase over the 4.1% predicted by the Midwestern Model and observed in the nineteenth century cemeteries examined in the current study.

These figures raise a question of vital significance to the field of public health: have increases in motor vehicle use, youth violence, drug addiction, and social pressures resulted in an upswing in adolescent deaths from external, preventable causes, or is this proportional mortality simply a result of the removal of infectious diseases from the equation? The total number of deaths provides some insight on the subject. Whereas teenagers accounted for 5.8% (8/137) of the dead recorded in Dubuque's City Cemetery for the sample year 1859-1860, they made up only 0.68% of U.S. deaths reported between 1999 and 2006. Approximately 2% of Dubuque's non-Catholic teenagers died in the sample year, or 2,000 per 100,000, compared to the 45.5 dead per 100,000 15- to 19-year-olds reported for the United States in 2014 (Kochanek *et al.* 2016). This nearly fifty-fold reduction in adolescent deaths is significant and demonstrates that regardless of the increases in accidental and violent deaths, such causes have not kept pace with *improvements* in public health. Turning again to the Dubuque City Cemetery records, when all deaths due to infectious diseases eliminated or rare among modern American teens (TB, typhoid, dysentery, cholera, malaria, etc.) are removed from the list, the number of dead adolescents is reduced to 49 (Table 11.1). The proportion of deaths due to accidents is now raised to 47%, which is consistent with twenty-first century mortality data.

Table 11.1. Causes of death listed for adolescents in the Dubuque City Cemetery burial records, 1855-1875, with deaths due to infectious diseases no longer common among American teens eliminated.

Disease:	**# of adolescent deaths**	**% of adolescent deaths**
Meningitis	10	20.4
Heart disease	4	8.2
Pneumonia	4	8.2
Seizures/epilepsy	3	6.1
Paralysis	2	4.1
Stroke	1	2.0
Diabetes	1	2.0
External causes:		
Accidents	23	47.0
Suicide	1	2.0
Total adolescent deaths:	49	100

However, suicide accounts for only 2% of adolescent deaths in the Dubuque City Cemetery, and around 3% of teenagers in available records from the MCPFC (Richards *et al.* 2016:Fig. 2.26). Neither Midwestern dataset includes any youth homicide victims, though adult murders are listed. Elsewhere in America, in the unstable social environments of the former Mexican frontier (1800s-1870s) and the post-bellum biracial South (1865-1900s), interpersonal violence was reported as causing 16% of teen deaths in the Campo Santo records and 13.3% in the Loudermilk day books (Davidson 2004a:799-820). Though the shortcomings of these sources have been discussed previously, the consistency of these numbers with modern teen homicide rates suggests that adolescent violence is not an entirely new issue in some parts of the country. Crist's (2006) review of published bioarchaeological reports identified 36 individuals from 16 historical American burial grounds not included in the current study who exhibited evidence of gunshot wounds. Five of these individuals, 13.9%, were adolescents or very young adults (Crist 2006:116).

Since the 1950s, when antibiotics and vaccines eradicated many fatal infectious diseases or drastically improved survival rates, adolescent mortality rates in the U.S. have remained unchanged, though mortality rates for the overall population have consistently declined (Singh and Yu 1996:560). Improvements in motor vehicle safety led to a decline in accidental adolescent deaths between 1968 and 1993 but this gain was cancelled out by rising numbers of homicides and suicides (Singh and

Yu 1996:562). Suicide rates for males 15 to 19 years old more than tripled between 1940 and 1980 and continued to rise into the 2000s (Shields *et al.* 2006:876). From 1979 to 1991, adolescent murder rates rose 30%, and by 2006, African American males 12 to 19 years old demonstrated an elevated mortality rate of 94.1 per 100,000, largely due to homicides (Miniño 2010:3-4; Singh and Yu 1996:562). Thus, based on the sources utilised in the current study, the answer to the public health question is two-fold. The massive reduction in adolescent mortality due to the elimination of infectious diseases as a common cause has left a high proportion of the remaining deaths blamed on accidental causes, though the proportion of the *living* adolescent population dying in accidents appears to have declined. However, increases in the number of reported teen homicide and suicide victims have kept the adolescent death rate steady despite the declines noted for all other age groups in twentieth and twenty-first century America.

11.3. Adolescent Mortuary Treatment

The first half of this thesis considered the health and activities of adolescents themselves. These individuals are largely removed from the conversation in the second half of the thesis, as, after death, they are no longer actors. Though they are the foci of grief and funerary rituals, they are not participants; their graves represent, instead, the thoughts and feelings of the adults who buried them (Baxter 2005:94). The identity interpreted from their burials does not embody who they were so much as how they were regarded.

11.3.1. SOCIAL ADOLESCENCE IN NINETEENTH-CENTURY AMERICA

In order to investigate possible differential mortuary treatment accorded to adolescents in nineteenth century America, it was first necessary to establish that the biological age category corresponded with a socially recognised life stage in this particular cultural context (Baxter 2005:3). The existence of social adolescence as a transitional stage which involved some of the responsibilities of adulthood but not the rights or freedom was established for the population at large, and specifically for the community of Dubuque, in Chapter 6. Adolescents usually worked, but did not have the legal right to marry or keep their own wages without parental consent. In

Dubuque, the approximate age brackets of adolescence were 13 to 18 years for girls and 15 to 19 years for boys, though variation, particularly among females, is clear from some marriage ages in the early years of the settlement. The 17- to 20-year-old girl in Burial 971 at Third Street, for instance, was likely considered a full adult well before death based on the pronounced pipe-stem notch in her left dentition.

In prehistory, and even in historical periods prior to the common issuance of birth certificates, life-course transitions were signalled by physiological cues rather than chronological age (Shapland and Lewis 2013:302; Temple 2018:241-242). The variability in the beginning of adolescence for most of the nineteenth century in America suggests that the development of obvious secondary sexual characteristics – growth of breasts and widening of hips or growth of facial hair and deepening of the voice – still influenced perceptions of age identity to some extent, despite the recording of birth dates. The transitional status of adolescent males was codified in law as early as the seventeenth century in New England, where 16-year-old boys were taxed and expected to train with the militia, but the tax payments and training equipment were to be provided by the head of the household. Boys performed adult duties but legally retained their child-like dependence until the age of 21 years (Field 2015). In practice, however, young men in Dubuque asserted independence at the age of 20 by marrying, starting their own businesses, or joining the army.

Through the nineteenth century, teen labour constituted an important contribution to home economy. In urban centres in the Eastern United States, as well as the U.K. and Australia, children often began employment between the ages of 10 and 15 years (Crewe 2018:299), though official employment under the age of 13 was rarely documented in Dubuque. Many immigrant, working-class urban children and adolescents had to forgo school but learned how to fit into the capitalist economy through work (and play) with peers (Yamin 2018). Work benefitted the family, but it was also considered essential for the development and maturing of the individual, whether it involved wage-earning, farming, or mastering household maintenance (Riney-Kehrberg 2000). The loss of a youthful contributor, then, would have been potentially devastating to the household financially as well as emotionally.

In the West, the pioneer economy “matured and emancipated children from undue prolongment of parental control” (Calhoun 1918, Vol. II:52). Meanwhile in

New England, in the mid- to late-nineteenth century, social reformers' focus on child labour issues, compulsory school attendance, and age-graded schooling brought an increasing awareness of demarcations of age which gradually led to an extension of the period of dependency (Schmidt 2015). Change inevitably came to the rest of the United States, traveling from east to west, as pioneer settlements became established towns and cities. Upper- and middle-class mainstream – largely Protestant – beliefs about child-rearing (and bereavement) crossed class lines, as Yankee Bourgeoisie publications spread new cultural ideals across the country (Baxter 2019a:38, 2019b:23). The creation of a more formal concept of adolescence is detectable in Dubuque records contemporary with the end of the active-use period of the Third Street Cemetery. By the 1880 Census, 14 was the earliest age at which a significant number of males and females had employment, up from 13 years for females, down from 15 years for males in 1860. Additionally, more males were staying in school at the age of 14, and female school attendance had substantially increased from the 1860 rates, now matching the rates for males from 14 to 19 years old (Mack and Clarke 2020).

In order to better understand culturally-specific age structures, Baxter (2005:19) recommends identifying initiation rituals which signify a change in status related to age. Evangelical Protestant religious "conversions," which were encouraged during youth but could occur at any age, served as an adolescent rite of passage only for some (Kett 1977:62-85). Catholic confirmation, which is typically conferred on individuals around the age of 13 or 14 years in modern American parishes, can also be viewed as an adolescent rite. However, this has only been the case for the last hundred years. In the nineteenth century, confirmation was administered to children who had reached the Age of Reason, which the church judged to occur at seven years (Scannell 1908). In some cases, First Holy Communion was administered in late childhood (e.g., Hoffman 1936), but since the appropriate age was determined by the parish or the parents, this cannot be consistently considered an adolescent initiation (Morrisroe 1908). The only definitive adolescent rite identified for the study populations is the Mexican *quinceañera,* a celebration of a girl's transition to womanhood on her fifteenth birthday, which reportedly has roots dating to colonial times (Tatum 2014:285; Verdin and Camacho 2019). The number of married 15-year-old girls (7 out of 28) noted on the 1864 Arizona Territorial Census records, and the proportion of 15-year-old males living away from home (84%, 16/19) suggests that the age truly marked the end, rather than the beginning, of the transitional adolescent period among Mexican Americans on the frontier. This distinction proved important for interpreting atypical mortuary treatment patterns in the Alameda-Stone Cemetery population.

11.3.2. COFFINS: DECORATED, PLAIN, OR ABSENT

In nineteenth-century America, mortuary decisions, including choice of burial container, were made within the framework of what was available, what was culturally appropriate, and what was financially feasible (Farrell 1980). Prior to the 1850s, when advances in mass-production made coffin hardware available to larger markets, coffin decoration of the non-perishable type – as opposed to painting and fabric palls – was rare (Springate 2015:57). By the 1880s and 1890s, the consumer culture that exploded alongside the Beautification of Death movement, aided by the expansion of transportation systems and the postal service, made decorative coffins available, desirable, and affordable for a large portion of the American public. From this time, through the turn of the twentieth century, decorated coffins were considered the norm for all but the poorest members of society (Bell 1990; Springate 2015:72-73, 79). The period during which decorative coffin hardware can be considered a "sensitive" indicator of mourner choice, then, is ca. 1855-1880, with the caveat that rural and far western markets lagged behind due to conservative tastes and/or lack of availability. This period almost precisely matches the use dates of the addition to the Third Street Cemetery, where most of the excavation occurred. The time spans of all the comparative cemeteries overlap with these years, with the exception of the Second Catholic Graveyard (1824-1850s) and the MCPFC (1882-1925). The complete absence of decorative coffin hardware – both simple and elaborate types – in the former, then, is not surprising, due to lack of availability. Though many of the pauper burials in the MCPFC had coffin handles, the motivation was more practical than social. Most of the handles were utilitarian rather than decorative, and their use was restricted almost exclusively to the larger coffins (adults and adolescents) for ease of manoeuvring around the sizable cemetery.

Along with the Third Street Cemetery, Voegtly, Grafton, Wells, and Alameda-Stone cemeteries were all used prior to 1880. These first three burial grounds were urban, and in each, the proportion of teenagers with elaborately decorated coffins was higher than for other age classes, though the differences were not statistically significant. The distribution of coffin hardware at rural Wells Cemetery, where decoration often consisted simply of patterns of brass upholstery tacks, was more consistent across age classes. This finding contradicts the hypothesis of Hacker-Norton and Trinkley (1984:51) that children too young to contribute to the home economy would rarely be afforded decorative hardware, since child-sized handles were not significantly less expensive than adult models. The two other rural burial grounds, Avondale (1869-1935) and Dove (1870s-1890s), date to the period when the fashion of decorative coffins had reached outlying areas, though availability may have still been an issue. Although these two samples are too small for definitive conclusions, it is clear that more teenagers in these communities (3 out of 4) were buried in elaborately decorated coffins than not.

Alameda-Stone Cemetery (1860s-1875), on the far western frontier, was abandoned before the railroad reached Tucson in 1880 (Heilen and Gray 2010a:12), which accounts for the general lack of decorative coffin hardware found in the excavation. The majority of coffins were plain (82.4%, 758/920), and, due to the scarcity and value of wood in the region, 12.7% (117/920) of burials contained no coffin at all. Almost 40% (14/36) of adolescents at Alameda-Stone were found in these uncoffined burials, and the absence of head niches – which were often found in earthen graves for adults and infants – suggests a lack of care expended in the burial process. Additionally, not one teenager was buried in a decorated coffin. Social adolescence was abbreviated on the frontier, particularly in the Mexican American community, as discussed above. More than 50% of teenagers listed as residing in Tucson on the 1864 Arizona Territorial Census were living away from the parental home. When these independent young adults died and were buried at Alameda-Stone, those without family in town apparently had unembellished funerals provided by municipal authorities in place of mortuary rites arranged by mourners. Had the Third Street excavation included more graves dating to the pioneer period of Dubuque's settlement (1833-1845), when the population was dominated by young, unmarried miners and when 14-year-old brides were not unheard of, this pattern of spartan burials for adolescents might have been observed in the original cemetery lot as well.

Freedman Cemetery (1869-1907) has the highest proportion of elaborately decorated coffins seen in the study. As the burial ground was urban, and most datable graves post-date 1885 (95%, 1,048/1,112), the prevalence of ornamental hardware is hardly surprising. Additionally, the African American community had adopted mortuary elaboration as a form of social resistance and signalling of economic success (Davidson 2004a). The age of the deceased would not have mattered in these circumstances, as the performance of ritual reflected on the living family rather than the departed. Thus infants were just as likely to have decorated coffins as teenagers. However, Davidson's (2004a) fine-grained study of coffin hardware types and costs identified some distinctions between age classes. During the early period at Freedman Cemetery (1869-1884), the total cost of hardware on adolescent coffins was, on average, higher than that of any other age class (Davidson 2004a:246-253).

The results of this study show that in the second half of the nineteenth century and the early twentieth century, adolescents were equally likely or more likely to be buried in elaborately decorated coffins than older and younger members of the same communities. Previous studies have found that coffin hardware is not a good indicator of socioeconomic status (Bell 1990; Cannon 1989; Little *et al.* 1992). The current work has demonstrated that decorative hardware is not, by itself, an accurate gauge of regard for the dead either, as its presence in any given burial or burial ground is subject to temporal and regional factors affecting availability and social acceptability. Additionally, the purchase of decorated coffins is governed by cultural preferences, and, at the lower end of the social ladder, coffin choice is certainly more influenced by a family's access to resources than other elements of mortuary treatment, such as burial attire and grave goods.

11.3.3. DRESSED FOR ETERNITY: A DEEP SLEEP OR A LONG JOURNEY

Whether an individual went to the grave dressed in his or her own clothes, an outfit hastily made for the occasion, or a purchased burial "wrapper," nineteenth-century funerary outfits came in two styles, to match the two metaphors for death.

The dead were either dressed in shrouds/gowns for a long sleep or in their "Sunday best" for a journey (Tarlow 1999). The two types of outfits also corresponded to the increasingly divergent visions of the afterlife – an angelic heaven or a domestic one. Unlike the choice of burial container, this decision was less governed by temporal trends. Though burial in day wear certainly increased in the second half of the nineteenth century (LeeDecker 2009:154; Taylor 1980:46), shrouds/gown remained popular, as is evidence by post-mortem photography into the 1900s, as well as etiquette guides (The Thanatos Archive, www.thanatos.net; *Harper's Bazaar* 1886). Financial constraints were also less of a concern when choosing a burial outfit, as costs ranged from non-existent (one's own clothes) to quite expensive for elaborate, factory-made wrappers purchased from an undertaker. Age was an influencing factor, as were regional and cultural preferences. Moreover, the Beautification of Death movement encouraged greater sentimentality in grieving and greater individuality in the expression of grief, with the bodily remains of the deceased the new focus (Tarlow 2000:231-232; Taylor 1980). Therefore, the selection of burial clothing became a deeply personal decision made by the principal mourners.

In the Third Street Cemetery, almost 95% of infants (352/371) were buried in outfits that left the archaeological signature of simple gowns or shrouds, with just a few straight pins or white buttons or no fasteners at all. While these gowns may have been trimmed adornments like lace and ribbons that left no evidence, the absence of a variety of clothing fasteners demonstrates that the costumes were not composed of separate clothing articles such as a jacket, shirt, and trousers, or a bodice and skirt. Many children were also buried in gowns, with only 20.6% (14/68) of child graves producing clothing fasteners indicative of day wear. The proportion of individuals buried in day wear continued to increase with age, and 28% (91/325) of adults interred in such outfits. One might expect adolescents to fall between the child and adult rates, given the apparent age-related vector. However, teenagers were buried in day wear more often than the other age groups (36.6%, 15/41). Though this higher adolescent rate was found to be statistically significant only in regards to the very low rate for infants, the fact that the pattern is repeated in five other burial grounds is worth noting. At Voegtly, Wells, Freedman, Avondale, and Dove cemeteries, the directional increase in the proportion of individuals buried in day wear is broken by the jump in adolescent rates, while at Grafton and Alameda-Stone, the rate for adolescents is the same as for adults (Figure 11.2). The outliers are again the earliest and latest burial grounds, the Second Catholic Graveyard and the MCPFC.

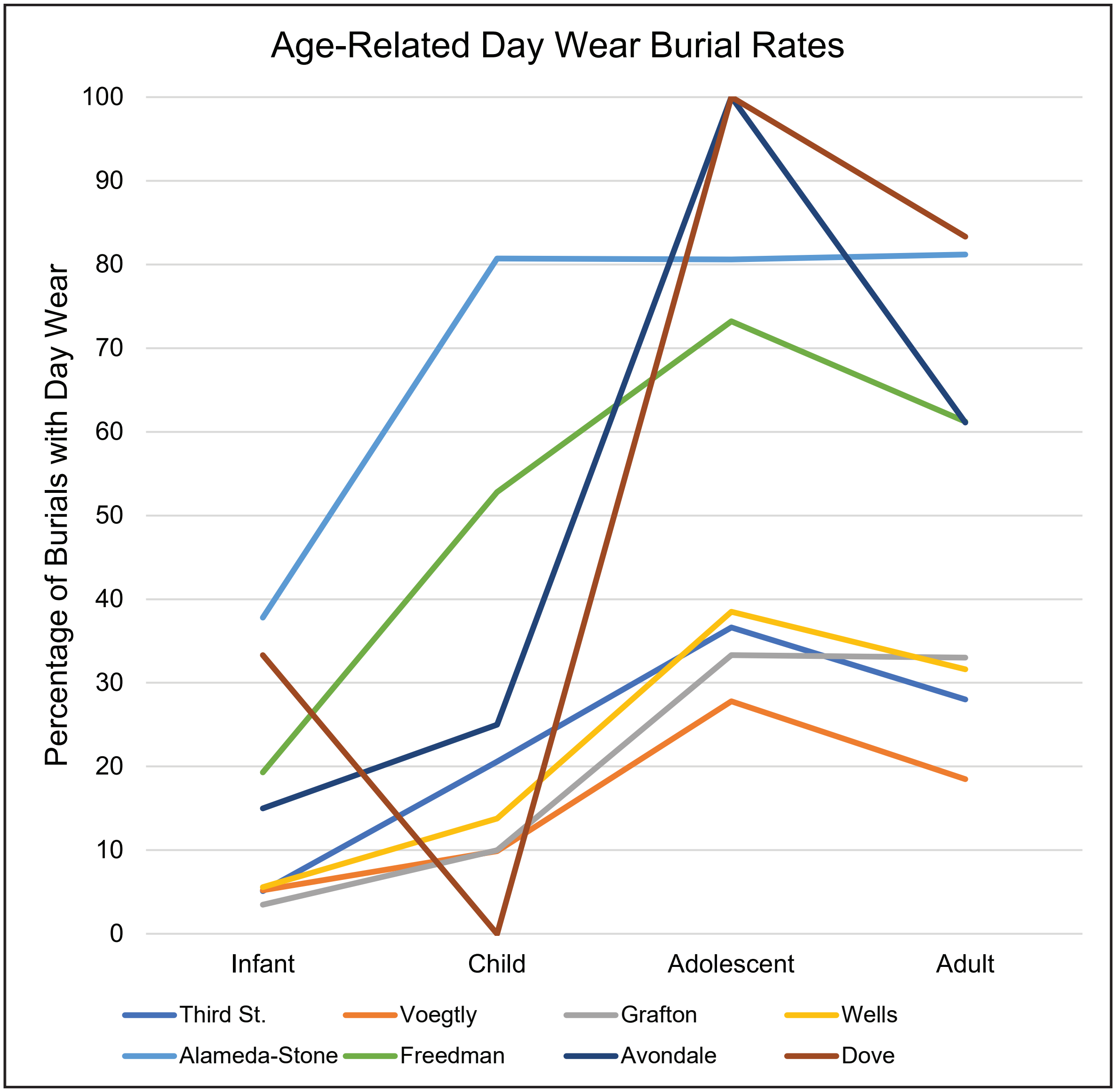

Figure 11.2. Graph showing the steady increase in the proportion of each cemetery population buried in day wear as related to age, with a jump in rates for adolescents.

The reasons infants were primarily buried in gowns were practical, as well as symbolic. Gowns of one sort or another constituted both day wear and sleepwear for babies and toddlers, and even small children often wore simple smocks with drawstrings rather than fasteners (Severa 1995:23). This kind of clothing was considered appropriate for individuals of this age, so to dress them differently for the coffin would require not only a special purchase but a conscious decision to present an identity different from that of daily life. Additionally, the metaphor of sleep, rather than a journey, was universally applied to infant deaths. Victorian mortuary monuments often show children in slumber and bear epitaphs claiming the deceased is "Sweetly sleeping" or exhorting the child, "Sleep on sweet babe and take thy rest" (Baxter 2005:105; Smith 1987:93-94). Nineteenth-century American and British literature, both the consolation genre and regular fiction, reflects this denial of death as well (Adams 1869; Lerner 1997; Wheeler 1990). This is not to say that resting prevented the very young from reaching heaven. Rather, they were so close to heaven, so innocent and having so recently arrived on earth, that the trip was very short (Baxter 2019b:139; Lerner 1997:96). As creatures who still belonged to God, they transitioned easily, and from the moment they died, they were "sleeping with Jesus" (Adams 1869:48; Plotz 1995:9; Smith 1987:94). What Taylor (1980:46) describes as the "decidedly sacred shroud" was appropriate garb, then, for these instant angels. Such innocence was not ascribed only to infants. Media coverage of the highly publicised death of Mary Marsh, a child actress who died in 1859 at the age of 11, shows that her fans viewed her as an idealised angel child who had flown to her heavenly home (Vey 2018).

The contrast between this view of the innocence of children and the more earthly perception of youths on the verge of adulthood is made clear by a note on the addendum to the third edition of Edward Bickersteth's volume commemorating the loss of his teenage daughter, Alice. "Eight weeks after the death of Alice, her fondly loved infant sister and Godchild Irene, aged eighteen months, fell asleep (Bickersteth 1872)." Note that 18-year-old Alice is dead, but the toddler merely sleeps. Sickbed and deathbed scenes are the mainstay of nineteenth century consolation literature, and though most examples portray infants and small children accepting the sleep of death (Plotz 1995:13-14), Bickersteth's (1872) sermon quotes his teenage daughter proclaiming, “I feel just like a sailor when he is called to go aloft; he tries all the ropes to see if they are firm. I have been trying them all, and, mother, they are all right.” Adolescent acceptance of death is portrayed as active. The last entry in the journal of Emily Shore, a teenager who died of consumption in 1839, reports, “I have had my long back hair cut off. Dear Papa wears a chain of it. Mamma will have one, too” (Lerner 1997:35). Victorian writers paint the “future life” of teenagers in domestic terms. The youth awaiting execution for murder in *Agnes and the Little Key* muses how his victim might shake his hand when they meet again in heaven (Adams 1869:92). Alice Bickersteth speaks of death as “going home,” and her mother reminds her she has “so many to love in Heaven” (Bickersteth 1872:31-36). In this domesticated heaven, described in detail in the writings of Elizabeth Stuart Phelps (1868, 1884) and others, inhabitants not only reunite with loved ones, but eat favourite foods, wear outfits of their own choosing, enjoy entertainments, continue education, keep their old occupations or learn new ones, and even fall in love and marry (Douglas 1975:63-64). With all these activities awaiting them in the afterlife, it is understandable that parents might want to send their near-adult children to the grave properly dressed and prepared to continue their interrupted path to maturity.

Across most of the cemetery samples in this study, a few adolescents were buried in clothes with decorative elements not found in the graves of other age classes. Whether this ornamentation took the form of cuff links and collar studs, jewellery, beading, or merely unique buttons, the extra touches can be interpreted as an effort to maintain or create a social identity for the deceased (Tarlow 2000:234). Post-mortem dress often represents a continuation of living habits. When the preferences of the adolescent dead are taken into consideration, the resulting choice in burial outfit will reflect the adoption of newer styles by younger generations (Aldridge 2008:96-99). The identification of unique clothing elements or accessories, which can only be recognised through careful comparison with the rest of the burial assemblage, is crucial for the establishment of differential treatment of adolescents (or any other group) in a cemetery. In two sample populations that did *not* exhibit differential mortuary treatment of teenagers through clothing, a high proportion of young people were nevertheless found buried in day wear. At Freedman Cemetery, many adolescents wore cuff and collar studs, pins, and jewellery, but no more so than adults, due to a cultural predilection for finery in the grave. Meanwhile, at Alameda-Stone, the high proportion is due to a general community preference for day wear combined with the fact that burial in the outfit worn at the time of death often carries the same archaeological signature as intentionally selected funerary day wear. That 11 out of 14 adolescents buried without coffins at Alameda-Stone had fasteners indicating day wear outfits emphasises this issue and underscores the importance of considering combinations rather than single burial attributes when analysing mortuary treatment.

11.3.4. GRAVE GOODS: RELIGIOUS, SPIRITUAL, OR A LOVING TOUCH

Mourners placed objects unrelated to attire in the coffins of adolescents (and others) for a variety of reasons. Some motivations are evident, while others are impossible to interpret more than a century after the fact, and there is little doubt that some of these artefacts represent accidental inclusions. Clearly religious, likely spiritual or traditional, and purely personal items appeared too infrequently in this study to contribute to the structure of the burial typology. However, observed patterns related to age, mortuary display, and cultural preferences are worth discussing briefly.

The presence of canonical Catholic religious items in graves at the Third Street Cemetery – rosaries, religious medals, etc. – was determined to be related to the level of mortuary display. The proportion of graves including such objects increased along the trajectory from plain to elaborate burial types. For comparison, only graveyards including at least a few Catholic interments could be considered. The low numbers of such objects found in the Second Catholic Graveyard, Dove Cemetery, and the MCPFC provided no insight, while the ample assemblage from Alameda-Stone was dominated by wreaths from the burials of infants and children. This pattern reflects a cultural preference still seen in American Hispanic communities, though these floral crowns were encouraged for all Catholic child burials in the nineteenth century (Ball 2003:329-330; Marino 1997; Thurston 1908).

Cultural preferences affected the inclusion of “secular” grave goods as well. This category includes all items not clearly related to canonical Christian beliefs, though many of these objects were included in the grave for reasons related to spiritual beliefs or folk traditions. Coins, the most common secular object, were recovered from nine of the ten excavated cemeteries in this study, excluding only the Second Catholic Graveyard. Perforated coins used in life as charms and coins placed on the eyes as payment for passage to the afterlife fall into the folk tradition category (Davidson 2004b, 2010), while coins likely concealed in pockets may have been intentionally placed or merely overlooked when dressing the dead. The presence of coins in Euroamerican, African American, and Hispanic graves, in Catholic and Protestant cemeteries spanning from the East to the West and encompassing all but the first third of the nineteenth century, indicates widespread American adoption of this Old World tradition, despite the low number of cases (1.3%, 65/4,888). Other spiritual objects were specific to cultural groups, such as the picture frames in graves at largely Hispanic Alameda-Stone (which may have held saints' images) and the serving ware and single shoe found at African-American Freedman Cemetery. Interestingly, Davidson (2004a:364-369) notes a trend among burials with spiritual grave goods at Freedman Cemetery that reverses the pattern seen for religious grave goods at Third Street. Coffins at Freedman that contained spiritual or folk objects cost *less* than the average for each given time period. Besides coins, only one type of object was found in multiple adolescent graves. The presence of dolls in the burials of African American teenage girls up to 19 years old is suggestive of the persistence of African traditions (Cameron 1997; Van Wyx 1998; Wood 1998), though this hypothesis requires further investigation.

At Third Street, secular objects were placed with adolescents more frequently (7.3%, 3/41) than with individuals of other ages, but this age-related preference was not seen in the comparative cemetery sample. Several of the objects found with teenagers relate to folk beliefs, including coins, as well as the plate and shoe recovered from coffin lids. Other items displayed with the youthful dead, such as photographs, scissors, or the magnifying glass shown in Figure 11.3, appear to be loving touches, intended to communicate personhood and an identity that persisted past the point of death (Harper 2012; Tarlow 2000:234). All of these objects – including the dolls, whether personal possessions or symbols of unborn children – are consistent with the mourners' ideation of death as a journey and heaven as a destination similar to one's earthly home.

Figure 11.3. Post-mortem photograph of a teenage girl with lilacs and a magnifying glass or monocle, ca. 1850. Daguerreotype. Image reproduced with permission from The Thanatos Archive.

11.3.5. ADOLESCENT BURIALS: INVESTMENTS IN HOPE

A burial typology was established for this study based on combinations of coffin and clothing attributes. The 4,888 observable interments were divided by age class and then assigned to one of the following six groups: Type 1 (plain coffin [or no coffin], burial in a shroud); Type 2 (plain coffin [or no coffin], burial in day wear); Type 3 (simple coffin, shroud attire); Type 4 (simple coffin, day wear attire); Type 5 (elaborate coffin, shroud attire); and Type 6 (elaborate coffin, day wear attire). When the entire sample is pooled, nearly 40% (1,944/4,888) of the graves fall into the Type 1 group. Type 1 burials represent a wide variety of circumstances: graves that predate the availability or popularity of mass-produced coffin hardware in an area; burials of or by groups who eschew mortuary elaboration as vulgar or impious or for other personal reasons; mortuary treatment arranged for out-of-favour family members; interments of individuals of low socioeconomic status by family members or by municipal authorities; and burials of unclaimed bodies. Given this variability, the study of mortuary treatment focused instead on the burial type observed in the largest proportion of adolescent graves. Almost 30% (58/201) of teenagers in the pooled sample from Third Street and the comparative cemeteries were given Type 6 burials. In both the Third Street sample and the pooled comparative sample, adolescents were interred in Type 6 burials significantly more frequently than all other age groups.

For decades, archaeologists laboured under the assumption that mortuary display would increase with the age of the deceased, in proportion to his or her value and importance to the family and the community (Saxe 1970:69-71). Under this model, an elaborate adolescent burial would be explained as a status display showcasing the wealth or importance of the family rather than that of the deceased individual. While this status signalling was undoubtedly the motivation behind at least some of the Type 6 teen burials, it cannot explain the observed proportions at Third Street and many of the other cemeteries. Upper class families could be expected to provide lavish funerals for family members of all ages, but such a trend would not result in a large percentage of adolescents with elaborate burials, particularly since each wealthy family would likely lose more infants than teenagers.

Some elaborate funerals involved massive outlays of money but, in fact, very little expenditure was required to leave the archaeological signature of a Type 6 burial. Interment in one’s own day wear clothing costs nothing, and a few cheap coffin decorations could be purchased for pennies and added to a homemade burial container. The intent of the display and the dressing of the corpse for a journey are the distinguishing characteristics of a Type 6 burial, rather than the overall cost. Thus, elaborate teen burials communicate little about the socioeconomic status of the families who made the funeral arrangements; rather they indicate the importance that the principal mourners placed on having a high level of mortuary display specifically for individuals on the threshold of adulthood as opposed to family members from other age groups, who were less frequently interred in Type 6 burials.

In her insightful study of ethnographic records in the Human Relations Area Files, Fox (1996) found that grief is one of the compelling motivations behind the treatment of deceased sub-adults. “…There is nothing rational, in terms of efficiency, in the amount of energy expended in the mortuary practices performed on children (Fox 1996:63).” Certainly in nineteenth-century America, any level of funeral costs for adolescents constituted “throwing good money after bad.” The loss of an individual who was just becoming a significant household contributor, combined with the resources spent – now futilely – on rearing the child from infancy to near-adulthood (Matthews 2010), was a doubled economic blow that compounded grief, rather than leading to rational mortuary restraint. While many historical studies have refuted the idea that Victorian parents did not mourn their infants, research in the field of evolutionary psychology suggests that parental devotion reaches a maximum level in adolescence (Wright 1994). This hypothesis goes beyond the notion that a teenager is more of a “person” and that any older child’s unlived future is easier to visualise and thus mourn. An adolescent who has just reached the point of reproductive maturity represents an asset on the brink of rewarding years of investment. The loss of such an individual requires the expenditure of much time and effort to create a replacement with the same reproductive potential. A modern grief study found that parents’ emotional response to the death of a child does indeed peak around puberty (Wright 1994:174-176). Though archaeologists have long avoided consideration of emotion and experience in interpretations of material culture – regarding such subjects to be unknowable – documentary sources available in historical archaeology permit access to such themes, through both direct evidence and metaphor (Tarlow 1999:20-49).

The amplification of grief over the loss of adolescent offspring was not reflected overtly in literature of the time but is sometimes referenced. For instance, in the poem *Oh! Say Not ‘Twere A Keener Blow*, the mother argues that her grief over a lost infant is as great as that concerning an older child, though the first stanza implies her feelings run counter to popular belief (Bayly 1848). In *The Captain’s Youngest*, the narrator notes that the parents loved their 14-year-old son more once he was dead (Burnett 1924). A study of nineteenth-century epitaphs in Delaware cemeteries found that offspring who had almost reached the age of independence were most likely to have gravestone messages beyond mere documentary information (Smith 1987:88-89). Rather than the standard formulaic verses, adolescent epitaphs often included remembrances of the deceased, such as “She was the sunshine of our home” or “An affectionate daughter. Similarly, a study of mid-nineteenth to early twentieth-century grave markers in Chicago found that markers for children over the age of 10 were among the most elaborate for single individuals of any age (Baxter 2019b:141-143).

Expression of these emotions regarding adolescents was particularly strong among American pioneers, who endured the hardships of frontier life with the intent that their offspring would inherit a country with more opportunities (Calhoun 1918 Vol. II:52). Parental response to these thwarted dreams is evident on grave markers for children like 16-year-old James Guthrie, whose brief epitaph reads "Buried Hopes" (Smith 1987:91) or Lulu Fellows, dead at 16 from typhoid fever, whose stone at Rosehill Cemetery (Chicago) proclaims, "Many hopes lie buried here." The attraction, then, of a heaven where the dead simply continue much of their earthly business is understandable, even if some portions of American society scorned the idea, and Mark Twain (reportedly) referred to it as "a mean little ten-cent heaven about the size of Rhode Island" (McDannell and Lang 2001:273). Because the Beautification of Death movement allowed for sentimental individualism within the societal framework (Baxter 2013), the principal mourners, presumed to be the parents, were free to create a funerary tableau that suited their vision of the afterlife, a place for their teenagers to continue maturing and assume their roles in adult society. The epitaph "Meet me in Heaven," found on the gravestone of a 19-year-old girl, expresses precisely this wish (Smith 1987:99).

The foregoing explanation of adolescent mortuary treatment hinges on the assumption that teenagers are buried by their parents or other close guardians. Thus, the failure of a cemetery assemblage from the second half of the nineteenth century to conform to the expectation of greater mortuary elaboration for adolescents may indicate a lack of familial involvement. Recognition of the absence of Type 6 burials for teenagers at Alameda-Stone led to additional research which revealed that the labour needs of the frontier setting and the traditions of the largely Hispanic population resulted in an abbreviated transitional period around puberty, which likely ended for girls at the age of 15, after the *quinceañera.* While some of the adolescent burials at Alameda-Stone included extra touches, like the heavily beaded outfit of the Native American girl (Burial 16811) or the reliquary locket concealing a human phalanx (Burial 8965), many teenagers were buried without even a coffin. These teenagers were likely living independently, as very young adults, and when they died away from home, their bodies were buried with minimal expense by municipal authorities or acquaintances. Though two adolescent burials from the MCPFC were classified as Type 6, the utilitarian coffin handles in these graves cannot be interpreted in the same way as decorative handles ornamenting a container with precious cargo. Clothing artefacts found with the individuals, a large rubber button and sock garters, distinguish them as outsiders rather than institutional residents. Whether they were dressed for the coffin by pauper relatives or were buried in the outfits in which they died, these two teenagers, like the rest in the MCPFC, went to the grave with the bare minimum of fanfare required for a "decent Christian burial" at the expense of the county.

11.3.6. MODERN ADOLESCENT FUNERALS AND COMMEMORATION

A visit to any modern American cemetery demonstrates, even to the casual observer, the persistence of differential mortuary treatment for the youthful dead. Above-ground evidence usually takes the form of non-traditional decorations and offerings. Mourners leave items like toys for infants and young children, and the graves of recently deceased adults are sometimes decorated to a lesser extent, particularly around the holidays. However, the widest variety of objects – including stuffed animals, "school spirit" items, clothing accessories, and photographs – adorn adolescent grave markers. Cemetery sextons are particularly lenient about marker decoration rules where the graves of young people are concerned, but these accumulations of offerings sometimes grow large enough to hinder regular cemetery maintenance (Edward Leonard, personal communication 2020).

Furthermore, such physical manifestations of grief are not restricted to the burial location. Roadside memorials at vehicle accident sites and spontaneous memorials to victims of violent death (Figure 11.4) have become increasingly common in America since the 1980s, and though these displays are created for individuals of all ages, they frequently appear at locations where teenagers have died (Haney *et al.* 1997; Reid and Reid 2001). A study of roadside memorials in Texas found that adolescents constituted the largest portion of commemorated victims, with a modal age of 17, and that "shrines" for dead teens were the most expansive (Reid and Reid 2011:347-350). Haney *et al.* (1997) observed that spontaneous memorials, whether erected by family members or strangers, are more inclusive than official funeral rites. Thus while their greater number may be explained by the families' or communities' greater sense of loss over the death of an adolescent, the size and persistence of such memorials is likely due to the participation of teenage peers, who prefer to mourn in their own way, outside the constraints of the traditional funeral setting. Items left at unofficial memorials – such as soda, beer, or energy drink cans, candies and snacks, ball caps, coins, and cigarettes – might not be welcome by family members (or maintenance crews) at the gravesite.

Figure 11.4. Spontaneous memorial to an 18-year-old homicide victim outside a fast food restaurant in Madison, Alabama. Photograph taken by author.

Though adolescents continue their mourning activities well beyond formal funeral rites, they also participate in the official services. Interviewed funeral directors in Iowa noted that teens attend peer funerals in large numbers, act as pallbearers, and even provide graveside music. They also contribute significantly to the personal items placed in the casket with the deceased, the range and number of which, as with roadside offerings, are far more extensive for teens than for individuals of other age groups (Michael Goddard, personal communication 2020; Michael Lensing, personal communication 2020; Edward Leonard, personal communication 2020).

Parents today likely feel no less grief than their nineteenth century predecessors at the loss of a child on the threshold of adulthood, and they are usually still responsible for making formal funeral arrangements. Yet it appears that they are no longer the source of adolescent mortuary elaboration. On average, *less* money is invested in adolescents' and children's funerals, because they constitute unanticipated expenses, as opposed to the often pre-planned, pre-paid funerals for older people (Edward Leonard, personal communication 2020). For the most part, differential mortuary treatment now originates from the larger community, which, lulled into a sense of safety by the modern level of control over death, is shocked by the sudden, unexpected loss of a person not considered old enough to die (Haney *et al.* 1997:159-160). This failure of acceptance, and the understanding that many teenage deaths are preventable, leads to a collective sense of grief that extends beyond the immediate social circle of the deceased (Haney *et al.* 1997:163). Funeral director Michael Goddard (personal communication 2020) has observed that when parents spend significant amounts of money on teenagers' funerals, they are motivated by the anticipation of widespread attendance, often including the entire student body of a high school. In this way, memorialisation of adolescents combines the modern format of the decedent-centred "American funeral," which originated in the nineteenth century, with the older Colonial model emphasising the communal loss (Huntington and Metcalf 1979:187-205; Stannard 1980:19-23).

Chapter 12

Conclusions and Future Directions

The two halves of this thesis were intended to dovetail neatly in a final finding of the relationship between manner of death and adolescent burial elaboration. Logically, deaths from chronic illness might produce more elaborate funerals, given the greater time available for making the arrangements. Conversely, the greater disruption to the social fabric caused by the sudden or violent death of a teen might lead to a greater outpouring of grief in the form of mortuary elaboration. Unfortunately, no such pattern was identified in the study sample. Either type of death seems to have elicited the same response from the principal mourners when an adolescent was lost. The answer to the seventh question posed in the introduction to this thesis is a resounding "no." Manner of death does not appear to have been a factor affecting funerary decision-making in nineteenth century America.

Investigation of the remaining six thesis questions proved more fruitful, illuminating temporal and regional aspects of America's medical history and demonstrating how mortuary behaviour reflected shifts in attitudes towards death, the afterlife, and public displays of grief in the nineteenth century. These questions and the overall findings, discussed at length in the previous chapter, are summarised below.

1) What were the leading causes of death for adolescents buried in Dubuque in the nineteenth century? How does the distribution pattern for adolescents differ from that of adults, young children, and infants in the same population? Does the distribution pattern differ for male and female adolescents? Documentary sources indicate that TB and accidents were the leading causes of death for teenagers in Dubuque, though evidence among the adolescent skeletons from Third Street was scant for the former and non-existent for the latter. The relative rarity of pathognomonic skeletal involvement explains the lack of direct evidence for TB. The absence of perimortem trauma may be due to the types of accidents experienced by teenagers, as the Dubuque City Cemetery records report drowning as the leading cause of accidental death for this age group. TB was responsible for approximately the same proportion of adult deaths as adolescent, though this rate was significantly higher than those of children or infants. To some extent, the low rate for younger sub-adults

may be due to a failure to diagnose infantile TB, which presents with symptoms quite different from the adult form (Fischer 1898). The high rate for teenagers, however, is related to pubertal changes in the immune system, which permit the development of adult-type pulmonary TB and which can leave adolescents more vulnerable to infectious disease in general, particularly in the later stages of puberty (Marais *et al.* 2005; McDade 2003). Accidents, meanwhile, caused a significantly higher proportion of deaths for adolescents than for any other age group. Though much greater representation of males among accident victims might indicate some association with young men entering the workforce, anecdotal evidence suggests that many of these accidents were related to recreation and stereotypical recklessness. TB fatalities, on the other hand, were more common among teenage girls, three of whom died from consumption for every two male fatalities. Overall, though, adolescent deaths reported in the City Cemetery records (1855-1875) were divided evenly between males and females. In contrast with common expectations concerning the relative hardiness of teenagers, the proportion of the living adolescent population in Dubuque that died in the sample census year of 1860 was not significantly lower than that for the adult or child populations. Skeletal evidence from Third Street indicates that frailty due to previous serious illness or malnutrition in infancy/childhood was a significant risk factor for mortality due to chronic disease in adolescence. Individuals who died in adolescence were more frequently observed with both early life and later life/perimortem pathology markers than those who survived into adulthood.

2) Do the nonreligious grave goods and elaborate burial outfits observed in some adolescent graves represent special mortuary treatment for individuals who died on the verge of adulthood? Though secular grave inclusions were found more often with teenagers than individuals of other age groups at Third Street, the rarity of these objects and of the adolescent-only clothing elements (collar studs, decorative beading, etc.) precludes their utility for establishing a distinct archaeological signature for adolescent burials. A more general rating of mortuary elaboration, based on six combinations of burial attributes, found that teenagers at Third Street were interred in the most elaborate type of burial (Type 6) with significantly greater frequency than all other age classes. Rather than representing family or individual status, these funerary tableaus communicated aspirational status constructed by the principal

mourners, presumably the parents. A teenager laid out in the most decorative container affordable, dressed in his or her Sunday best, perhaps with a token tucked in the coffin, was prepared for the journey to a heaven not dissimilar to the earthly home, where the path to adulthood could continue relatively uninterrupted. Such a vision offered comfort to parents for whom the loss of a child and burgeoning household contributor represented the failure of a major investment in time, assets, and hope, as well as the loss of reproductive potential in the form of grandchildren (Wright 1994:174-176). The Beautification of Death movement made such funerals possible by allowing greater public displays of sentiment, focusing attention on the body of the deceased, creating acceptance of the domestic version of the afterlife, and permitting individualism in memorialisation (within societal norms), all encouraged by the wide array of new, funeral-specific materials made available to consumers.

3) Are the patterns of mortality observed for adolescents in Dubuque reflected in other nineteenth-century cemeteries in the Midwest and in other regions of the United States? As with the Third Street Cemetery, where teenagers comprised 4.9% (43/883) of the burial population, the adolescent age group accounted for the smallest portion of nearly every cemetery sample used for comparison, ranging from 2.1% to 7.3% of individuals who could be assigned to a general age class. Skeletal evidence of TB and perimortem trauma was rarely identified among teenagers from the comparative cemeteries. Interestingly, the prevalence observed at Third Street was reversed; more adolescents were found with perimortem trauma (n=7) than with possible TB lesions (n=1). The dearth of direct evidence for TB in Midwestern and northern urban centres with documented burdens of the disease (St. Louis, Pittsburgh, Grafton, Milwaukee) may be related to the aforementioned rarity of pathognomonic skeletal involvement and difficulty observing subclinical skeletal presentation (periosteal bone formation on pleural rib surfaces), combined with the small sample sizes. In Dallas, Texas, where adolescent deaths from TB were documented but not observed in the skeletal sample from Freedman Cemetery, additional factors may be responsible for the lack of evidence. The greater susceptibility of African Americans to TB may have resulted in adolescent deaths that occurred too quickly for the bones to be affected (Roberts and Buikstra 2003:19-20, 50-51). Additionally, regardless of the prevalence of TB in living populations, the proportional mortality observed in the burial samples may be

biased due to quick-killing competing causes of death, such as the tropical fevers that took a much greater toll on populations in the southern portions of the United States, according to historical sources like the Campo Santo de San Fernando burial records. Immune vulnerability brought on by puberty would have left adolescents as susceptible to diseases like yellow fever as to TB and typhoid. As emphasised by Goodman (1993), the cultural context of disease is as key in the interpretation of skeletal evidence of disease (or the lack of it) as the consideration of multiple indicators of health.

Regional differences regarding external causes of death were observed in both the comparative skeletal samples and historical records. Interpersonal violence, which was not reported as cause of death for any teenagers in the Dubuque City Cemetery or the MCPFC records, resulted in the loss of a 15- to 20-year-old female in Grafton Cemetery and a 14- to 16-year-old male at Alameda-Stone. The Campo Santo burial records and scant funeral home records from Dallas demonstrate that adolescents were often homicide victims in these two communities. These records, combined with higher rates of violent death observed among adult skeletons in the Alameda-Stone and Freedman Cemetery samples, indicate that social instability led to greater adolescent bloodshed along the Southwest frontier in the nineteenth century and in African American communities during the Reconstruction (1865-1877) and Jim Crow (1880-1965) eras in the American South. General perimortem trauma, likely relating to accidental causes, was primarily observed in male adolescent skeletons (4/5) in the comparative samples, consistent with the proportions reported in the Dubuque City Cemetery records. Despite regional differences in disease loads and levels of interpersonal violence, the pooled data from the comparative adolescent samples and the Third Street Cemetery conform well with Midwestern Model predictions based on a 12% skeletal manifestation of TB/pulmonary disease cases and perimortem trauma rates excluding drowning.

4) Can the health status of adolescent non-survivors inform understanding of overall population health and/or life-course fluctuations in disease resistance? By including individuals of all ages, this study of adolescents inadvertently discovered evidence of improvements in early-life survival consistent with claims of declining infant and child mortality rates in the late nineteenth century (Lee 2007). In the later

cemetery populations, broader age distribution of CO and PH – as healed lesions in adolescents and adults – shows that more children were surviving severe illness and/or nutritional stresses. In these same populations, the greater prevalence of LEH in adolescents (non-survivors) than adults (survivors) suggests that mortality risk was higher during puberty for individuals with acquired frailty due to childhood illness. The effects of acquired frailty were further investigated by focusing on individuals with skeletal evidence of both early life stress or disease and later life or perimortem disease. In the Third Street Cemetery sample, a significantly higher proportion of adolescents exhibited this "double signal" compared to adults, suggesting that frailty acquired through early childhood health stresses caused elevated mortality risk related chronic disease during puberty (particularly post-PHV), when the immune system was vulnerable due to competing energy demands for growth and reproductive development. Unfortunately, inconsistencies in the original skeletal data collection from the comparative samples prevented application of this analysis to the other cemetery populations *in toto*. However, the results from a skewed sample with an over-representation of adolescents is suggestive of a similar pattern with regards to acquired frailty. Additional work with larger, more consistent datasets is needed to confirm the observed pattern. Though the early-life skeletal markers used in this study could indicate any number of conditions, and though death could be caused by a variety of chronic diseases, the biphasic nature of TB, with its differential manifestation in juvenile versus pubertal and post-pubertal individuals, corresponds well with the observed double signal. A study that included skeletal collections from regions both with and without significant TB infection rates could determine whether or not this double signal is amplified in populations with a heavy burden of TB.

5) Is differential mortuary treatment for adolescents evident in other Catholic cemeteries? Can differences between the treatment of adolescents and others be detected in Protestant cemeteries where the inclusion of secular grave goods is more common? Are similar trends evident in burial grounds serving African American, Hispanic, and historic-period Native American communities? The only other entirely Catholic burial ground included in this study was the Second Catholic Graveyard in St. Louis (1824-1850s), which predated the material culture developments associated with the Beautification of Death. Physical manifestations of intense

parental grief over the loss of teenagers there may have taken the form of perishable decorations such as coffin palls or unusually large flower displays (Figure 12.1) or grave markers which were removed and lost, but all of these are unavailable for archaeological analysis. In partly-Catholic and Protestant cemeteries, the inclusion of secular grave goods was largely determined by cultural traditions rather than the idiosyncratic impulses of principal mourners. Cemeteries serving African American, Hispanic, and Native American families – Alameda-Stone, Freedman, Avondale, and Dove – exhibited the highest proportions of graves with secular objects, and these inclusions were generally unrelated to the age of the deceased. One possible exception is the placement of dolls in the graves of older teenage girls at Freedman Cemetery. More extensive research into historic African American burial practices is needed to determine whether or not this tradition extends beyond the few instances observed in Dallas.

Figure 12.1. Photograph of Marie Holm, age 16, in her casket, surrounded by a sea of flowers. Marie died of TB in Chicago in 1906. Photograph reproduced with permission from Paul Scalcini.

Levels of mortuary elaboration were determined for all age classes in the comparative cemeteries using the same typology developed for the Third Street Cemetery. When the samples were pooled, adolescents were again found to be more frequently interred in Type 6 burials than children and adults. Examination of the results from individual cemeteries, however, painted a more complex picture of temporal and regional variation. Two important trends gradually spread east to west across American territory in the nineteenth century. The Beautification of Death movement required the establishment of transportation systems to carry from the East the material culture that corresponded with the ideas. Meanwhile, middle-class beliefs about child-rearing and the importance of age separation and extended offspring dependency could not take hold until pioneer communities developed sufficient "civilisation" for a middle-class to exist. The lack of consumer goods and of a substantial middle class are evident in the material culture of the Alameda-Stone Cemetery (1860s-1875) in Tucson, Arizona, where very few coffins had decorative hardware and adolescents were not interred in Type 6 burials. The combination of the frontier status of the community with the influence of the largely Hispanic population led to an abbreviated transitional period for adolescents, with even young teenagers living independently. Those who died away from home were presumably buried away from home, without parental involvement in the funeral arrangements, which explains the significant proportion of teenagers buried without coffins at Alameda-Stone. Not all adolescents in the cemetery were interred so carelessly. The most unusual grave inclusion, a reliquary locket containing a human hand phalanx, was found with a 12- to 15-year-old presumably buried by family members.

Even back East, access to popular funerary trappings like coffin hardware was more limited in rural areas than urban. Yet in rural cemeteries like Wells and Avondale, the efforts expended to provide elaborate burials for adolescents are more easily detected, as compared to later urban cemeteries like Freedman, where all age groups (aside from infants) were given equally fancy burials. Evidence of differential mortuary treatment for teenagers at Freedman was only discovered through more fine-grained analysis. Davidson's (2004a) investigation into coffin hardware costs found that in the Early Period (1869-1884), teenagers' coffins were more expensive, on average, than those of any other age group.

6) Is there any evidence of differential treatment of adolescents in institutional cemeteries? The only institutional burial ground included in this study, the MCPFC, provided little evidence of special mortuary treatment for teenagers. In the nineteenth century, all individuals were buried on the grounds in coffins constructed by the lowest bidding contractors, with utilitarian handles installed solely for the sextons' ease. Some teenagers were buried in day wear, which would be unusual for institutional residents. However, historical documentation and a previous study (Richards 1997; Richards *et al.* 2016) suggest that adolescents interred at the MCPFC were more likely to be unclaimed bodies buried with their possessions at the time of death or paupers buried with some familial involvement. One possible pauper burial, that of an 18- to 22-year-old male, included the only hint of a loving touch seen in an adolescent grave at the site. The woman's shoe found near his cranium may have been placed on the coffin lid by a relative in accordance with an African American tradition documented by Davidson (2010). The remainder of the teenage burials represented the bare minimum required for a "decent Christian burial" arranged at the expense of the municipal authorities (Richards 1997:11).

This thesis can be considered a study of the frailty and value of adolescents in nineteenth century America. Results of this project support the hypothesis that competing energy investment demands during puberty can increase immune vulnerability in individuals previously weakened by poor nutrition or disease in early childhood. Furthermore, this acquired frailty constituted only one part of adolescent mortality risk. Accidents took a high toll on this age group, due to hazards posed by recreational and, perhaps, occupational activities, a problem which persists to this day and disproportionately affects the male population, creating a heterogeneity of frailty related to recklessness. Both types of frailty warrant further investigation. A similar study of pathology in burial populations from other time periods and regions has the potential to determine if the pathological "double signal" is widespread among adolescents or if it is, as proposed, magnified in communities affected by *Mycobacterium tuberculosis*. A targeted study of the timing of LEH in adolescent non-survivors could determine whether health insults during a particular timeframe (early infancy, weaning, etc.) contribute more to pubertal immune vulnerability. High resolution isotopic data collected from dental remains of teenagers (and adults) could identify intervals of malnutrition and investigate the impact of scarcity during particular periods of development on later mortality risk (Gowland 2015:532). A larger study of nineteenth-century death and census records from urban and rural areas – which was beyond the scope of the current project – would provide more precise data concerning adolescent death rates in relation to the living adolescent populations and would allow for more direct comparison between nineteenth century and modern mortality patterns.

Though sometimes difficult to discern against the background noise of temporal, regional, and cultural variations, differential mortuary treatment of adolescents was evident in the tendency to dress and prepare these young people for a journey to a domesticated heaven where they could continue the path to adulthood. Ornamental clothing accents, perhaps reflecting youthful tastes, and objects of religious, spiritual, and personal significance included in many (though certainly not all) teen graves express the principal mourners' difficulty in accepting the loss of a valuable individual representing years of investment in time, resources, and hope. These items, which allowed parents both to envision their offspring in such an afterlife and to present this vision publicly, were absent in cases of nonfamilial body preparation. Further study of the material culture of adolescent burials in the United States, as more cemeteries are excavated, could provide greater refinement of the patterns observed. Additionally, research into African American burial traditions could shed light on the practice of interring teenage girls with dolls and determine if it has roots in African spiritual beliefs, perhaps related to the fertility of young women in the afterlife. A study of burial attire using nineteenth-century post-mortem photography and data collected from clothing preserved in iron coffin burials would benefit all archaeologists struggling to interpret the appearance of burial outfits from just a few buttons and fabric scraps.

A secondary goal of this project was to make other researchers aware of data available from some of the less publicised cemetery excavations, as well as the shortcomings of some well-known projects. Unfortunately, insufficient funding and the American rush to rebury human remains can lead to compromised data collection and the permanent loss of valuable information. The database included with this thesis combines osteological and material culture data from both published and unpublished sources concerning 10 excavated cemeteries, with a total sample of 5,045 individuals. This database can be used as a starting point to determine what information is available for a particular skeletal collection and can provide data for topics not discussed in the current project, such as carious lesion and abscess rates or evidence of coffin lining.

The primary purpose of this project, however, was to make sense of the loss of individuals who were not expected to die, teenagers who had survived the dangerous periods of immature immunity in infancy and childhood, but had not yet reached the age of heart attacks, cancer, and the general declines associated with senescence. Adolescents in nineteenth-century America, burdened with acquired frailty and pubertal immune vulnerability, living in various high-pathogen environments, and suffering the consequences of their own impulsive behaviour, actually perished at rates comparable to those of children and adults at the time. Though not uncommon, their deaths were nevertheless devastating to the families who had invested so heavily in their rearing, only to see them falter on the threshold of maturity. The new vision of heaven which arose during this period helped to soften the blow with assurances of life continued and meeting again on the other side. Though many of these teenagers went to the grave dressed and prepared for the journey to this promised domestic afterlife, they were nonetheless mourned as “Buried Hopes.”

IV. APPENDICES

Appendix A

Adolescent Burial Descriptions, Third Street Cemetery

Burial 1994-4

Burial Integrity: This burial was disturbed by mechanical stripping, with the loss of the feet and the distal ends of the tibiae and fibulae. Very little coffin wood was preserved.

Burial Description: The individual was buried in a supine and extended position, with arms extended and elbows slightly bent. The left hand rested on top of the os coxa, and the right hand rested on the sacrum.

Coffin Shape and Dimensions: Indeterminate, length 175 cm (est.), max. width 55 cm (est.)

Coffin Hardware: 3 plain swing bail coffin handles, 1 coffin screw

Coffin Furnishings: None

Burial Clothing Remnants: 2 Prosser buttons on lower chest, at midline, and 1 very large Prosser button, location not recorded.

Grave Goods: Wooden-bead rosary, in left hand.

Condition of Remains: Bone preservation was poor. Most elements were represented, but the long bones were incomplete, and the axial skeleton was fragmented.

Age Estimate and Basis: 15.0-16.0 years, based on the root formation of the M3s (1/2-3/4 complete) and the lack of fusion of the metacarpals. Since the epiphyses of the unfused phalanges were not preserved, it is not possible to determine whether this individual was prepubertal or in early puberty. No other pubertal markers preserved/recorded.

Sex: Indeterminate due to preservation and the individual's age.

Dental Analysis: The dental remains were in good condition. All teeth were present, though the M2s and the maxillary right C were not quite fully erupted. The M3s were unerupted but observable. No LEH were present. Attrition was slight. Slight calculus was observed on all teeth. No carious lesions were present.

Pathology: No pathological conditions were observed.

Burial 15

Burial Integrity: This burial was disturbed during mechanical stripping of soil, as the remains were resting immediately below the sod. The cranial remains and lower legs were slightly damaged by the heavy equipment. Only a small amount of wood was present, and the nails and staining of the soil were used to define the coffin shape.

Burial Description: The body was placed in a supine and extended position, with the skull facing to the left. The left arm was slightly flexed, with the hand resting next to the left os coxa and proximal femur. The right arm was in the same approximate position, with the hand under the ilium, probably as a result of decomposition of the pelvis. Green staining from contact with copper salts was present on several parietal fragments, the right scaphoid, and the distal ulna and radius. A small amount of hair, light brown or blond, was preserved by the copper salts on one parietal fragment.

Coffin Shape and Dimensions: Hexagonal, length 160 cm, max. width 50 cm

Coffin Hardware and Furnishings: None

Burial Clothing Remnants: None, though copper salt staining suggests that pins originally buried with the individual did not survive.

Grave Goods: None

Condition of Remains: The remains were damaged and in poor condition, crumbling when touched. Few rib and hand bones were recovered, and none of the foot bones were present due to mechanical stripping of the lower leg area. Both patellae and the left fibula were absent.

Age Estimate and Basis: 15.5-17.5 years, based on epiphyseal closure and dental development. The line of fusion on the femoral head was clearly visible, indicating the individual was older than 14 years (if female). The epiphyseal rings of the vertebrae were unfused, suggesting the individual was younger than 21. Development of the M3 (root ¾ complete) suggests an age of 15.5-17.5 years. Pubertal stage markers were not observable.

Sex: Sex was evaluated as possibly female, based on the presence of a wide sciatic notch and the generally gracile remains.

Dental Analysis: Most of the maxillary teeth and the mandibular right I1s and I2s were loose, as the alveolus was poorly preserved. The individual displayed severe dental pathologies in the form of 28 carious lesions on 17 teeth. Six of these tooth crowns were completely destroyed by caries. Fourteen teeth displayed a total of 28 linear enamel hypoplastic defects. The LEH were positive for six periods of enamel growth disruption at 0.5 to 1 year, 1 to 1.5 years, 2 to 2.5 years, 2.5 to 3 years, 3 to 3.5 years, and 3.5 to 4 years.
Pathology: The remains displayed two pathological conditions, slight cribra orbitalia in the left orbit and periosteal new bone formation on the tibiae and femora shafts and unidentified shaft fragments. The changes observed on the long bones included woven and sclerotic bone apposition.

Burial 19

Burial Integrity: The burial was just beneath the sod on the edge of the empty zone. The remains were crushed and limited to an incomplete cranium, the right femur diaphysis, and diaphyseal fragments of both tibiae. Given the burial's location, it is likely it was disturbed in the 1940s.
Description: Exact burial position could not be determined.
Coffin Shape and Dimensions: Hexagonal, dimensions indeterminate; outer crate length 220 cm, width 55 cm
Coffin Hardware: 4 coffin screws
Coffin Furnishings: None
Burial Clothing Remnants: None
Grave Goods: None
Condition of Remains: Highly fragmentary and limited to cranial and lower limb fragments.
Age Estimate and Basis: 13.5-15.5 years, based on dental development. Pubertal markers unobservable.
Sex: Indeterminate
Dental Analysis: All the dental remains were present. No carious lesions or enamel defects were noted.
Pathology: No pathological conditions were observed.

Burial 24

Burial Integrity: The cast-iron casket was found immediately below the sod. The burial was partially damaged during mechanical stripping in 2007, and also appeared to have been damaged in the past by compaction due to heavy equipment driving over the burial. Most of the right arm bones and both hands were removed during an earlier disturbance episode.

Burial Description: This shouldered cast-iron casket with wooden outer crate held a skeleton in a supine and extended position, with the left arm slightly bent so that the hand probably rested on the lower abdomen. The feet were crossed over one another.

Coffin Shape and Dimensions: Shouldered cast-iron casket, length 200 cm, max. width 55 cm; outer crate too damaged for measurements.

Coffin Hardware: Viewing pane glass, 3 screws, 6 swing bail coffin handles with geometric decoration

Coffin Furnishings: Coffin lining fabric

Burial Clothing Remnants: 2 black rubber buttons, 5 metal buttons, 1 Prosser button, bowtie/cravat fabric. Three buttons were found along the upper chest, 3 more along the lower thoracic vertebrae region, and 2 buttons immediately lateral to the left os coxa. Since the right os coxa area was not present, it is unknown if there were matching buttons on the right hip area.

Grave Goods: None

Condition of Remains: The remains were in moderately good condition; some elements were missing due to mechanical disturbance. The cranium was fragmented but nearly complete. Missing elements include the sternum, scapulae, right os coxa, right patella, right arm bones, most of the right foot, all hand bones, the ribs, the sacrum, and several vertebrae.

Age Estimate and Basis: 15.5-18.5 years, based on epiphyseal fusion. The distal epiphyses of the femora and tibiae were unfused, and the epiphyseal rings of the vertebrae were unfused or only partially fused. No M3s were observed.

Sex: The cranial features and postcranial metrics suggest the individual was male.

Dental Analysis: The dental remains included tightly compacted large teeth with congenitally absent maxillary left and right I2s. The M3s were likely congenitally

absent, as there appeared to be no room in the alveolar bone for the eruption of third molars. Carious lesions were observed on three maxillary teeth, the left I1, right I1, and right M1. Seven LEH were noted on four teeth and were positive for an episode of enamel growth disruption between 2 and 2.5 years.
Pathology: No pathological conditions were observed.
Identification: John Joseph Blake. His obituary gives cause of death as a "brief illness."

Burial 71
Burial Integrity: Intact burial
Burial Description: The burial consisted of an elaborately decorated hexagonal coffin within an outer crate. The individual was interred supine and extended, with the arms bent. The left hand was resting at the top of the right os coxa, with the right hand overlapping. The individual was buried in a jacket, pants, and probably some kind of hat or cap, as indicated by the placement of numerous metal buttons.
Coffin Shape and Dimensions: Hexagonal, length 180 cm (est.), max. width 46 cm; outer crate length 195 cm, width indeterminate
Coffin Hardware: Coffin lid cross fragments, 6 thumbscrews, 6 swing bail handles with floral decoration/upward-pointing finger, 6 escutcheons, 17 dummy screws
Coffin Furnishings: None
Burial Clothing Remnants: 28 metal buttons (formerly cloth-covered), including 9 extending from lower thoracic to inferior edge of pelvis, 4+ in lower chest to waist region; 1 under hands crossed over abdomen; 1 large and 1 small button on right mid lower arm; one small button lateral to larger button on by left lower arm; 3 across upper edge of left ilium; one at back of cranium. Remaining metal buttons found during screening. Also recovered were 1 Prosser button, 1 collar stud (found under chin), and jacket fabric in the area of the chest and left humerus.
Grave Goods: None
Condition of the Remains: Bone preservation was fair to good. The cranial vault was crushed by ground pressure. No ribs were recovered, and the vertebrae consisted primarily of the C1, C2, and thoracic and lumbar arch portions. Most of

the postcranial elements were present except the sternum, clavicles, many of the hand and foot bones.

Age Estimate and Basis: 15.0-18.0 years, based on evaluation of epiphyseal closure and dental development. The humerus head and distal femur were unfused. The proximal tibia was partially fused. Dental development of the observable second molar (apex closed) and third molar (R ¼) provided a similar age range, despite retention of the dm2s in the mandible. Fusion of the distal radius indicates the individual was post-pubertal.

Sex: Indeterminate based on osteological evidence, but clothing remnants indicate a male individual.

Dental Analysis: Dental remains included all the maxillary left teeth including the unerupted M3; all the maxillary right teeth except the M3; and all the mandibular teeth except the P2s and M3s. The mandibular dm2s were still present. The maxillary right incisors and all the mandibular incisors were in poor, fragmented condition and little could be discerned about their condition or possible pathologies. Four LEH on three teeth were positive for one episode of enamel growth disruption occurring between 3.5 and 4.0 years.

Pathology: No pathological conditions were observed.

Burial 85

Burial Integrity: The legs and portions of the left side of the skeleton were dragged approximately one meter south of the burial by heavy equipment during soil stripping.

Burial Description: The individual was interred supine and extended, with both arms along the sides.

Coffin Shape and Dimensions: Indeterminate

Coffin Hardware: None

Coffin Furnishings: Lining tacks

Burial Clothing Remnants: None

Grave Goods: None

Condition of the Remains: Bone preservation was very good, including the ribs, vertebrae, and smaller bones. Absent elements included the left hand bones and left radius and ulna.

Age Estimate and Basis: 15.5-18.0 years, based on epiphyseal ossification. The maxillary M3 root was ½ complete, providing a dental age of 15.5-17.5 years. All of the phalanges were fully fused, but the iliac crest and distal radius were unfused, indicating the individual had passed peak height velocity but was still in puberty.

Sex: Indeterminate

Dental Analysis: All teeth were present except for the mandibular M3, which were either unerupted or congenitally absent. Small carious lesions were present on the occlusal surface of both maxillary M1s and the mandibular right M2. A total of nine LEH observed on five teeth were positive for three episodes of enamel growth disruption occurring from 2.0 to 2.5 years, 2.5 to 3.0 years, and 3.0 to 3.5 years.

Pathology: The right fibula had a partially healed fracture on the distal third of the shaft, approximately 12.2 cm superior to the distal end. Slight periosteal new bone formation was present. An incompletely fused fracture line was observed on the lateral surface and lateral half of the posterior surface. The fracture extended onto the medial surface and had completely healed in this area. The shaft bowed slightly, but observably, both laterally and posteriorly. The right tibia exhibited no trauma.

Burial 90

Burial Integrity: This burial was partially excavated, then inundated by heavy rain, and submerged under water for six weeks prior to completion of the excavation. Wood preservation was good prior to flooding, though bone preservation was poor.

Burial Description: The individual was interred in a supine and extended position, with elbows bent and forearms resting on abdominal area. No hand bones were preserved.

Coffin Shape and Dimensions: Hexagonal, length 178 cm, max. width 38 cm (est.); outer crate length 196 cm, width 56 cm

Coffin Hardware: 4 ring bail handles with cherubs, 6 coffin screws

Coffin Furnishings: Coffin lace

Burial Clothing Remnants: 1 Prosser button (sternal area), 1 hook and eye (to left of neck)
Grave Goods: 1 Miraculous Medal (French inscription) with braided cord (near neck), 1 crucifix (near neck)
Condition of the Remains: Bone preservation was poor and was made worse by water damage after flooding. The long bones were represented by shafts and epiphyseal fragments.
Age Estimate and Basis: 13.5-17.5 years, based on the unfused humeral head, unfused distal tibia, and development of the M3s (root ¼ complete).
Sex: Indeterminate
Dental Analysis: Dental preservation was good. Several teeth were absent including the maxillary right I1, both I2s, right C and P1, and the mandibular right I2. The timing of the tooth loss (antemortem or post-mortem) is unknown due to poor preservation of the alveoli. LEH observed on the maxillary left I1 could not be measured because the CEJ was not present. Two LEH were present on the mandibular right P1. Small carious lesions were observed on the maxillary left P1 and right P2 and M1, as well as the mandibular left M2. The maxillary left I1 has a large carious lesion, and the mandibular right M2 had two lesions. Carious lesions destroyed the mandibular right M1 crown and part of its root.
Pathology: No pathological conditions were observed.

Burial 186
Burial Integrity: The intact burial had well preserved wood, including the coffin lid.
Burial Description: The individual was buried supine and extended, with the left hand lateral to the femur. The right hand held a rosary and rested on the right os coxa. Hair was preserved on the cranium in the area where twisted wire was present.
Coffin Shape and Dimensions: Hexagonal, length 180 cm, max. width 44 cm
Coffin Hardware: None
Coffin Furnishings: None
Burial Clothing Remnants: None
Grave Goods: Vulcanized rubber rosary in right hand, twisted wire around cranium

Condition of Remains: Bone preservation was fair; all elements were represented except for the sternum, though many epiphyses were absent.
Age Estimate and Basis: 13.5-15.5 years, based on dental development and recent fusion of the olecranon process. The lack of fusion of the phalangeal epiphyses of the hands indicates the individual was prepubertal or in early puberty.
Sex: Though sex estimations for young adolescents are not reliable, this individual was identified as possibly female based on a very wide sciatic notch.
Dental Analysis: The dental remains were in very good condition. All permanent teeth were present except the mandibular right M1, which was lost antemortem. The M3s were unerupted. A total of 40 enamel defects were observed on 22 teeth, including linear defects, hypoplastic pits, discoloured enamel, and disrupted enamel. Additionally, disruption of root growth was evidenced by linear grooves on the root surfaces. The LEH were positive for a period of growth disruption between 1.5 and 2.0 years, three periods between 2.5 and 4.0 years, and three periods between 4.5 and 6.0 years. Two maxillary teeth and one mandibular tooth had small carious lesions. The maxillary left M1 had a large carious lesion, exposing the pulp chamber, and leading to a periapical abscess in the alveolar socket.
Pathology: Slight cribra orbitalia was observed on the left orbit only. No other pathological conditions were noted.

Burial 206, Individual 1
Burial Integrity: This intact burial had well preserved wood, including the coffin lid and the outer crate.
Burial Description: The primary individual in Burial 206 was interred in a red-painted hexagonal coffin made of tulip poplar, which was enclosed in a rectangular outer crate. Placed inside this outer crate, around the edges of the adolescent's coffin, were the commingled remains of three additional individuals, who were likely disinterred from older burials during the digging of the adolescent's grave shaft.

The adolescent individual was buried in a supine and extended position, with the elbows slightly bent and the hands resting on the pelvis, left hand over right. A large pair of scissors was placed to the left of the cranium. Dark brown fabric was preserved over the ribcage, and clear glass seed beads were sewn to the fabric over the sternum to form the shape of a heart. Light-brown silk ribbons were also preserved over the ribs. Two pieces of ribbon formed a cross just to the right of the sternum. Two pieces of sewn, pleated ribbon formed a rosette over the left ribs. A heavily corroded religious medal was found beneath the fabric on the sternum. A metal button and three white Prosser buttons were also recovered with the remains. Insect pupa casings were found throughout the collected fabric and around the teeth. Their presence suggests a longer than usual interval between death and interment, since evidence of perimortem insect activity was not encountered in other burials.

Coffin Shape and Dimensions: Hexagonal, length 181 cm (est.), max. width 43 cm (est.); outer crate length 202 cm, width 53 cm

Coffin Hardware: Teardrop-shaped viewing pane, white metal coffin lid cross, 10 urn-shaped thumbscrews with decorative escutcheons, 6 swing-bale handles with cross-shaped lugs, 25 diamond-shaped ornamental tacks, and 5 large ornamental tacks with geometric designs.

Coffin furnishings: None

Burial Clothing Remnants: Brown wool garment fabric with 35 glass seed beads, silk ribbons, 3 Prosser buttons, 1 metal button

Grave Goods: 1 religious medal (illegible)

Condition of Remains: Bone preservation was good, with all elements represented except the right scapula and clavicle and both first ribs.

Age Estimate and Basis: 17.5-19.5 years, based on third molar development and epiphyseal fusion. The distal radius was fully fused, while the distal ulna showed evidence of recent fusion and the iliac crest was unfused, indicating that the pubertal growth spurt was ending at the time of death.

Sex: Indeterminate, based on osteological markers. Grave goods suggest a female individual.

Dental Analysis: The dental remains were in good condition. All teeth were present except the mandibular M1s and right P2, which were lost antemortem. Twenty-seven LEH were observed on 11 teeth, suggesting four separate periods of enamel growth disruption between 2.0 and 4.0 years, and two periods between 5.5 and 6.5 years. Two maxillary and one mandibular tooth had small carious lesions, and

the crowns of both maxillary M1s were completely destroyed by caries. Periapical abscesses were active in the sockets of both of these M1s at the time of death.
Pathology: Periosteal new bone formation was observed on the pleural surface of seven of the left ribs, covering the area from the neck to the angle of each rib. Healed or healing cribra orbitalia was present bilaterally, and labyrinthine endocranial lesions were observed on the frontal. Schmorl's nodes were present on seven thoracic vertebrae. Spina bifida occulta was observed on the first sacral vertebra.

Burial 236

Burial Integrity: The foot of this coffin was disturbed by heavy machinery during stripping.
Burial Description: The individual was buried in a supine and extended position, with arms extended at the sides.
Coffin Shape and Dimensions: Hexagonal, length 163 cm, max. width 39 cm; outer crate length indeterminate, width 42 cm
Coffin Hardware: None
Coffin Furnishings: None
Burial Clothing Remnants: None
Grave Goods: None
Condition of Remains: Bone preservation was fair to poor, with the facial skeleton incomplete and long bones represented only by eroded shafts. The left radius and ulna were absent, along with the vertebrae, ribs, patellae, and hand and foot bones.
Age Estimate and Basis: 11.5-14.5 years, based on development of mandibular M2s and M3s. No pubertal markers were observable.
Sex: Indeterminate
Dental Analysis: All permanent teeth were present, including the unerupted M3s. Fragile, flaking enamel prevented observation of enamel defects. Two carious lesions were present, one on the maxillary right P2 and one on the mandibular left M1.
Pathology: No pathological conditions were observed.

Burial 255

Burial Integrity: This intact burial had well-preserved coffin wood. The grave shaft floor was significantly deeper than those of the surrounding burials.

Burial Description: The individual was buried in a supine and extended position, with arms along the sides, elbows slightly bent and hands resting on the upper femora. Long, wavy brown hair was preserved, with a portion of the hair twisted and loosely coiled at the back of the head, held in place by a copper pin. Desiccated brain tissue was found inside the cranium.

Coffin Shape and Dimensions: Hexagonal, length 180 cm, max. width 45 cm

Coffin Hardware: None

Coffin Furnishings: None

Burial Clothing Remnants: 1 Prosser button found near mandible, hair pin found with coiled hair

Grave Goods: None

Condition of Remains: Bone preservation was excellent. The cranium was complete, and most long bones were whole. Only the hyoid, patellae, and some of the phalanges were missing.

Age Estimate and Basis: 15.0-19.0 years, based on recent fusion of several epiphyses, active fusion of the distal ulna, and unfused sternal ends of the clavicles. This fusion pattern indicates that the pubertal growth spurt was ending at the time of death.

Sex: Female, based on a wide sciatic notch and cranial morphology.

Dental Analysis: The dental remains were in good condition, with all teeth were present. Interestingly, the maxillary I1s and I2s were strongly shovelled. A total of 17 enamel defects were observed on all 12 incisors and canines. The mandibular defects took the form of LEH, though the maxillary teeth exhibited only opacities. Measurements of the LEH indicate three periods of enamel growth disruption from 1.5 to 2.0 years, 2.0 to 2.5 years, and 3.5 to 4.0 years. Small carious lesions were present on the occlusal surfaces of all four M3s and the maxillary M2s.

Pathology: Slight porosity on the posterior parietals suggested healed porotic hyperostosis. Periosteal new bone formation, both active and healed, was observed on the femora, tibiae, and fibulae, suggesting some type of systemic disease. Porosity and thinning of the cortical bone was noted on both calcanei, tali, and most other tarsals and metatarsals. These bones were very lightweight for their size, suggesting osteopenia/osteoporosis. A compression fracture was noted on an unidentified lumbar centrum, and Schmorl's nodes were present on one lumbar and five thoracic vertebrae.

Burial 270

Burial Integrity: This intact burial had little wood preserved.

Burial Description: This individual was buried in a supine and extended position, with arms along the sides. A mass of hair was present below the occipital, preserved by the presence of a metal circlet. Copper salts were observed near the right ilium, but the artifact was too deteriorated for collection.

Coffin Shape and Dimensions: Hexagonal, length 160 cm, max. width 42 cm

Coffin Hardware: None

Coffin Furnishings: Coffin lining fabric, possible remnants of coffin lace.

Burial Clothing Remnants: None

Grave Goods: Twisted wire circlet around cranium

Condition of Remains: Bone preservation was somewhat variable. The cranium and long bones were largely complete, with some epiphyses recovered, though the ribs and thoracic vertebrae were poorly preserved and the sternum was absent. Only a few fragmentary bones were recovered from the hands, though the tarsals and metatarsals were preserved.

Age Estimate and Basis: 12.5-17.5 years, based on lack of fusion of the femoral and tibial epiphyses, and the formation of the root cleft on the mandibular M3. Pubertal stage could not be determined, as all markers were unobservable.

Sex: Indeterminate

Dental Analysis: The dental remains were well preserved. All the permanent teeth were present except for the mandibular left P2, the socket of which retained a dm2. Twenty-six LEH were observed on 22 teeth, suggesting several episodes of enamel growth disruption, including one at 1.5 to 2.0 years, three episodes from 2.5 to 4.0 years, and two episodes from 4.5 to 5.5 years. Defects were visible on the lingual surfaces of several teeth, as well as the buccal surfaces. Carious

lesions were observed on all four M1s and the mandibular left M2 and dm2.
Pathology: No pathological conditions were observed.
Nonmetric traits: The S1 was lumbarized.

Burial 287

Burial Integrity: This intact burial had some wood preserved, including the coffin lid.
Burial Description: The individual was interred in a supine and extended position, with arms extended at the sides. The right hand rested to the right of the body, but the left elbow was slightly bent, with the left hand resting on the left femur.
Coffin Shape and Dimensions: Hexagonal, length 190 cm, max. width 56 cm; outer crate dimensions indeterminate
Coffin Hardware: 5 coffin screws
Coffin Furnishings: Lining tacks
Burial Clothing Remnants: None
Grave Goods: None
Condition of Remains: Bone preservation was fair, with most elements present, but much of the cortical surface exfoliating. The sternum and most foot bones were absent, and though most ribs were present, they were highly fragmented.
Age Estimate and Basis: 15.5-20.5 years, based on the development of the M3s (root ½-¾ complete). The first sacral body was not fused to the second. The distal radius was fully fused, indicating the individual was post-pubertal.
Sex: Female, based on a very wide sciatic notch, raised auricular surface, and the presence of a preauricular sulcus. Three of the cranial markers also indicated a female, though the chin shape, external occipital protuberance, and some postcranial measurements fell within the ambiguous or male range. Stature was estimated to be 164.9 ± 4.24 cm, based on the length of the fully fused radius.
Dental Analysis: The dental remains were in good condition. All teeth were present except the maxillary left I2 (congenitally absent), mandibular left M1 (lost antemortem), and maxillary right M3 (reason for absence undetermined). The remaining three M3s were not yet erupted. Twenty-six LEH were observed on 14 teeth, indicating five periods of enamel growth disruption between 2.0 and 4.5

years and another period from 5.0 to 5.5 years. Five maxillary and four mandibular teeth had carious lesions, including the mandibular right M2, which had its crown completely destroyed by caries. A periapical abscess was active in this socket at the time of death.

Pathology: An unidentified lumbar vertebral body fragment appeared compressed, with depressions visible in the centre of the superior surface and the right side of the inferior surface. No other pathological conditions were observed.

Identification: Ellen Blake

Burial 302

Burial Integrity: This intact burial was found just south of the east-west oriented road through the cemetery. The wood of the outer crate was very well preserved, though the coffin wood was not present.

Burial Description: The individual was buried in a supine and extended position, with arms extended at the sides and elbows slightly bent. Each hand was resting on the corresponding os coxa. A green stain was found on the right os coxa, but the copper object that caused the stain was not preserved. Two pieces of a clay pipe stem were found beneath the outer crate wood, at the bottom of the grave shaft. These were likely associated with the original digging of the shaft.

Coffin Shape and Dimensions: Hexagonal, length 179 cm, max. width 65 cm; outer crate length 215 cm, width 76 cm

Coffin Hardware: 7 coffin screws

Coffin Furnishings: Lining tacks

Burial Clothing Remnants: None

Grave Goods: None

Condition of Remains: Bone preservation was fair. The cranium was incomplete, and most long bones were represented by shafts only. The ribs were represented by body fragments, the vertebrae by arches. The os coxae were incomplete, and few hand and foot bones were recovered.

Age Estimate and Basis: 18.5-22.5 years, based on the root development of the mandibular M3s (apex ½ closed). No pubertal markers were observable.

Sex: Male, based on cranial markers and the few postcranial measurements that were possible.

Dental Analysis: The dental remains were in poor condition, with enamel flaking off and heavy post-mortem staining. Many teeth were missing from the maxilla, including the left M1 through M3 and the right P1, P2, M2, and M3. Because alveolar bone was poorly preserved, it is unknown whether these teeth were lost antemortem or post-mortem. The maxillary left P2 was lost antemortem, with the socket fully resorbed, and the maxillary right canine was unerupted. The maxillary I1s and I2s exhibited shovelling. LEH were observed on both maxillary I1s, indicating a period of enamel growth disruption between 2.0 and 2.5 years. Six maxillary and six mandibular teeth had carious lesions.

Pathology: Small lytic lesions of unknown aetiology were observed on the endocranial surface of the frontal near the coronal suture and on the right parietal. Slight porosity and lamellar bone apposition were noted on three left and two right rib fragments from the vertebral portions of the ribs, observations consistent with pulmonary tuberculosis or other pulmonary disease. Mild, active periosteal new bone formation was observed on the tibiae, with woven bone laid down primarily along the anterior surfaces of the shafts. The left tibia was slightly more affected than the right. One of the few hand bones recovered was pathological. The distal articular surface of a proximal phalanx from the left hand was completely destroyed by unknown processes.

Nonmetric traits: This individual exhibited several traits, including lambdoidal and sagittal ossicles, a palatine torus, and bilateral third trochanters and hypertrochanteric fossae.

Burial 349A

Burial Integrity: This intact burial had some of the coffin wood preserved.

Burial Description: The coffin designated 349a was centred on top of a larger adult coffin (349B). The lower coffin was found immediately below the upper coffin, with no soil in between. Both coffins were orientated on the same long axis, which suggests the two were intentionally stacked, likely during a single burial episode. These coffins were found at the south end of an area where eight coffins were so tightly packed together that individual grave shafts could not be discerned. The individual in 349A was buried in a supine and extended position. The right elbow was bent, with the wrist resting on the fifth lumbar vertebra, and the hand palm down on the sacrum. The left elbow was slightly bent, and the left hand resting on the left ilium, partly covering the right phalanges. The cranium was tipped forward, and the preserved shoe soles were partly vertical, as if the coffin was just long enough for the individual.

Coffin Shape and Dimensions: Hexagonal, length 162 cm, max. width 40 cm (est.)

Coffin Hardware: 4 swing bail handles with floral/scroll decoration, 14 thumbscrews, 14 escutcheons, 14-18 ornamental tacks (crucifix design)

Coffin Furnishings: None

Burial Clothing Remnants: 2 Prosser buttons (1 sternal, 1 near right radius), 5 copper pins (1 near right scapula, 2 near thoracic vertebrae, 1 sternal, 1 on left ilium), 2 leather shoes with black glass beads, 1 copper-alloy finger ring (left index finger)

Grave Goods: Twisted wire (around cranium), glass and porcelain bead rosary (both hands), 1 religious medal (illegible, next to T12)

Condition of Remains: Bone preservation was very good. All elements were represented except the sternum and foot phalanges, and many epiphyses were recovered.

Age Estimate and Basis: 13.0-14.5 years, based on dental development and epiphyseal fusion. The apex of the mandibular P1 was ½ closed, and the roots of the mandibular P2 and M2 were complete, indicating an age of 12.5-15.5 years. The sacral alae were fused. Lines indicated recent fusion of the distal humerus, radial head, and pelvic elements, suggesting the individual was greater than 13.0 years old. At the time of death, the glenoid fossa and olecranon were actively fusing, indicating an age of 13.0-15.0 years. The distal radius, phalanges, and iliac crest were unfused at the time of death, suggesting the individual was prepubertal or in early puberty.

Sex: Sex could not be determined osteologically, but clothing items and grave goods suggest a female individual.

Dental Analysis: The dental remains were in good condition. All teeth were present except for the maxillary M3s, which appeared congenitally absent, and the mandibular left M3 (status unknown). The mandibular right M3 was unerupted. A deciduous root tip, probably from a dm2, was still present in the alveolus between the maxillary right P2 and M1. A total of 24 EHLs were observed on 22 teeth, indicating four periods of enamel growth disruption from 1.5 to 3.5 years and additional disruptions between 4.0 and 4.5 years and 5.5 and 6.0 years. Two small carious lesions were observed on the maxillary left M1 and right I2.
Pathology: No pathological conditions were observed.

Burial 355
Burial Integrity: Some coffin wood was preserved in this intact burial.
Burial Description: The individual was buried in a supine and extended position, with arms extended at the sides, hands lateral to the femora. Desiccated brain tissue was recovered with the cranium.
Coffin Shape and Dimensions: Hexagonal, length 170 cm, max. width 44 cm
Coffin Hardware: 5 coffin screws, possible coffin lid cross fragments
Coffin Furnishings: Lining tacks
Burial Clothing Remnants: 9 Prosser buttons (6 near cranium, 2 at midline on thoracic vertebrae, 1 near left humerus), 1 copper pin (near left forearm)
Grave Goods: None
Condition of Remains: Bone preservation was very good. All elements (and many epiphyses) were recovered, except for some of the hand and foot phalanges.
Age Estimate and Basis: 15.0-16.0 years, based on dental development and epiphyseal union. The maxillary M3 roots were ½ to ¾ complete, suggesting an age of 15.5-20.5 years. Epiphyses actively fusing at the time of death include the heads of the humerus, radius, and femur; femoral trochanters and distal femur; and proximal tibia, which place the individual between 14.0 and 18.0 years. However, lack of fusion of the metacarpals indicated the individual was younger than 16 years old. As the distal radius, phalanges, and iliac crest remained unfused, the individual was likely prepubertal or in early puberty at the time of death.
Sex: Indeterminate

Dental Analysis: The dental remains were in very good condition, though heavy post-mortem staining prevented observation of enamel defects. All permanent teeth were present. Slight shovelling was observed on the maxillary incisors, and the M2s had Carabelli's cusps. The left maxillary M3 had an enamel pearl and enamel extension. Only one enamel defect was observed, seen on the maxillary left P1. The maxillary left M1 and mandibular left M1 and M2 had small carious lesions.
Pathology: Healed cribra orbitalia was observed bilaterally. Labyrinthine endocranial lesions were widespread on the endocranial surface of the vault, with the greatest amount of bone change occurring on the frontal and fewer lesions on the parietals and occipital. Slight periosteal new bone formation was observed on the visceral surface of eight of the left ribs, not including the 1st and 2nd ribs. The affected area extended from the head almost to the angle of each rib. This bone change is suggestive of tuberculosis or other pulmonary disease. A bony exostosis was observed on the inferolateral line of the intertubercular groove of the left humerus. Another was found on the anterior half of the distal shaft, and may be related to a well-healed fracture, as the bone is flat rather than curved.

Burial 361B
Burial Integrity: Burial 361B was undisturbed by modern earthmoving or historic gravedigging activity, even though the coffin was below Burial 361A (and offset to the north).
Burial Description: In addition to being below 361A, Burial 361B was also above Burial 361C. The outline of Burial 361B's coffin was perfectly superimposed over 361C (though slightly longer). The wood of both coffins was well preserved, and there was no soil between the coffin bottom of 361B and the coffin lid of 361C suggesting the coffins were intentionally stacked in a single interment episode. These burials were located in an area where eight coffins were so tightly packed together that individual grave shafts could not be discerned.

The individual in Burial 361B was interred in a supine and extended position, with the feet very close together. The right elbow was bent 90°, with the hand resting near the left os coxa. The left arm was strongly flexed, with the forearm resting just lateral to the humerus, but the bones of the left hand were found between the humerus and forearm, with some medial to the elbow. The movement of these small bones was likely due to bioturbation as well as settling, as the coffin of 361B shifted due to the collapse of the coffin lid of 361B. The pelvis of 361B was shifted to the right, and the manubrium was shifted on top of the left ribs. The cranium was turned onto the left side, and the mandible shifted forward out of the temporomandibular fossa. A Seated Liberty quarter-dollar was found in each orbit, with Liberty facing up in the right socket, and the eagle facing up in the left socket.

Coffin Shape and Dimensions: Hexagonal, length 195 cm, max. width 49 cm

Coffin Hardware: None

Coffin Furnishings: None

Burial Clothing Remnants: 1 octagonal, gold-plated collar stud with an undiscernible embossed design (on 1st thoracic vertebra); 2 oval-shaped red glass and copper alloy cuff links (at wrists); 2 copper pins (1 near head of left 3rd rib, 1 near left humerus); small amount of fabric on lateral surface of proximal left femur

Grave Goods: 2 Seated Liberty quarter-dollar coins dated 1856 and 1858 (one in each orbit)

Condition of Remains: Bone preservation was good, with all elements represented except for the hyoid and foot phalanges.

Age Estimate and Basis: 16.0-17.5 years, based on the root development of the mandibular M2s (apex ½ closed) and the maxillary left M3 (root complete), as well as recent fusion of the humeral heads and the major elements of the os coxae. The distal radius and phalanges were fused, but the iliac crest remained unfused, suggesting this individual's pubertal growth spurt was ending at the time of death.

Sex: Male, based primarily on the narrow sciatic notch and the large mastoid processes. Stature calculated from the length of the fully fused femora was estimated at 164.7 ± 3.27 cm, which is consistent with the measurement of the remains in situ (163 cm).

Dental Analysis: The dental remains were in good condition. All teeth were present except for the mandibular M3s and the maxillary right M2 and M3, all of which appear to have been congenitally absent. The individual had a pronounced overbite. Enamel extensions were observed on three M1s, and the fourth (maxillary left) exhibited a Carabelli's cusp. A total of 53 LEH were present on 20 teeth (including 11 anterior teeth), indicating seven periods of enamel growth disruption between 1.5 and 5.0 years. Hypercementosis was observed on the roots of the mandibular P2s. Eighteen carious lesions were observed on 12 maxillary teeth, though no lesions were present in the mandibular teeth. A periapical abscess was observed in the maxillary left M2 socket.

Pathology: The shaft of the right ulna was markedly bowed, with the head and distal end both oriented laterally. No evidence of fracture was observed, so it is possible that the deformity was a residual effect of rickets in infancy. Moderate periosteal new bone formation was present on the maxillary palate, anterior to the transverse palatine suture. Schmorl's nodes were observed on the T11 through L1 centra.

Nonmetric traits: Several ossicles were present including an asterionic bone, parietal notch bones, and a lambdoidal suture bone. The first sacral vertebra was lumbarised, and its arches were not fused together (spina bifida occulta). A large acetabular crease was present bilaterally; an area of moderate porosity was observed inferior to the fissure in the left acetabulum.

Burial 369

Burial Integrity: This intact burial was located on the northern edge of the area where eight coffins were so tightly packed together that individual grave shafts could not be discerned. Little coffin wood was preserved, but bone preservation was good, and desiccated brain tissue was recovered.

Burial Description: The individual was buried in a supine and extended position, with arms extended at sides. The left hand was lateral to the left femur, and the right phalanges were resting on the right femur.

Coffin Shape and Dimensions: Hexagonal, length 146 cm, max. width 37 cm

Coffin Hardware: 6 coffin screws

Coffin Furnishings: Lining tacks

Burial Clothing Remnants: 4 Prosser buttons, including 1 plain button at each wrist, 1 calico button on 7th cervical vertebra, 1 piecrust button on lower right ribs

Grave Goods: None

Condition of Remains: Bone preservation was very good with all elements present except the hyoid and the 11th and 12th ribs. Many epiphyses were recovered.
Age Estimate and Basis: 13.0-14.5 years, based on epiphyseal fusion and dental development. The femoral heads were just beginning to fuse at the time of death. The metatarsals were fused and the first metacarpal was actively fusing, though the remaining metacarpals were unfused. Without a sex determination, age is difficult to estimate from these epiphyses, but an age of 13.0-16.0 years is suggested. The crowns of the mandibular M3s were between ¾ complete and complete, indicating an age range of 11.5-14.5 years. The distal radius, phalanges, and iliac crest were unfused, suggesting this individual was prepubertal or in early puberty.
Sex: Indeterminate
Dental Analysis: The dental remains were in good condition. All the permanent teeth were present and in occlusion except the M3s, which were unerupted, and the maxillary right P1, which was either unerupted or congenitally absent. A total of 19 LEH were observed on 14 teeth, with measurements suggesting three periods of enamel growth disruption between 2.0 and 3.5 years and one episode between 4.0 and 4.5 years. One mandibular tooth and three maxillary teeth had small carious lesions.
Pathology: No pathological conditions were observed. A pectoralis major cortical defect (common finding) was observed on each humerus, and the right clavicle displayed a distinct rhomboid fossa.

Burial 378
Burial Integrity: This intact burial had almost no coffin wood preserved.
Burial Description: The individual was interred in a supine and extended position, with the right arm extended at the side. The left elbow was bent 45°, with the hand resting on the sacrum. A religious medal with a single bead was found with the left hand.
Coffin Shape and Dimensions: Hexagonal, length 195 cm, max. width 50 cm
Coffin Hardware: 2 coffin screws
Coffin Furnishings: None

Burial Clothing Remnants: 1 copper pin (location not recorded)
Grave Goods: 1 religious chaplet in the left hand, with gutta percha bead and illegible medal
Condition of Remains: Bone preservation was fair. The hyoid, sternum, patellae, phalanges, and all right hand bones were absent, and the ribs were in poor condition. All long bones were present, though many were fragmented.
Age Estimate and Basis: 17.5-21.0 years, based on recent union of the femoral head and dental development. The roots of the mandibular M3s were complete, and the apices of the maxillary M3s were ½ closed. Because the ossification stage of the unfused iliac crest was unobservable, pubertal stage could not be determined.
Sex: Female, based on the wide sciatic notch, all cranial features, and the general gracility of the bones. Based on the length of the fully fused femur, stature was estimated to be 153.4 ± 3.72 cm.
Dental Analysis: The dental remains were in good condition. All teeth were present except the maxillary right I2 and left M3, which appear to have been lost postmortem. The mandibular M3s were only partially erupted. A total of 11 LEH were observed on nine teeth, indicating two enamel growth disruptions between 0.5 and 1.5 years and two between 2.0 and 3.0 years. Seven maxillary and three mandibular teeth had carious lesions.
Pathology: The left talus displayed an os trigonum. A small lesion medial to the articulation suggests an injury may have caused separation of the Steida's process. Schmorl's nodes were observed on two mid-thoracic vertebrae.

Burial 396

Burial Integrity: This intact burial had well preserved wood from both the coffin and outer crate.
Burial Description: The individual was buried in a supine and extended position, with arms extended at the sides, hands lateral to the os coxae. A small ambrotype photo in a wooden frame was resting to the right side of the cranium, but the image was too degraded to be recovered.

Coffin Shape and Dimensions: Hexagonal, length 180 cm, max. width 50 cm; outer crate length 210 cm, width 62 cm
Coffin Hardware: 6 coffin screws
Coffin Furnishings: None
Burial Clothing Remnants: 6 Prosser buttons (1 hobnail button near cranium, 1 plain button on right clavicle, 2 on left ribs)
Grave Goods: Ambrotype photograph in a wooden frame, resting to left of cranium
Condition of Remains: Bone preservation was fair. The cranium was complete, but most of the postcranial skeleton was fragmented. The lower ribs and thoracic and lumbar vertebrae were poorly preserved, and the left patella and all phalanges were absent.
Age Estimate and Basis: 17.0-20.5 years, based on the development of the maxillary M3 (root ¾, 16.5-20.5 years), the complete fusion of the distal femur (17.0 years or older), and the recent fusion of the proximal tibia (ca. 14.0-18.0 yrs).
Sex: Female, based on a wide sciatic notch, cranial markers, and overall postcranial size. Stature calculations based on the length of the fully fused right femur provided an estimate of 153.4 ± 3.72 cm.
Dental Analysis: The dental remains were in good condition. All teeth were present except the mandibular left M1, which was lost antemortem; the M3s were only partially erupted. Shovelling was observed on the maxillary I2s. A total of eight LEH were observed on eight teeth, with all measurements corresponding to a single period of enamel growth disruption between 2.5 and 3.0 years. The maxillary right M2 and mandibular right M2 both had carious lesions.
Pathology: No pathological conditions were observed.
Nonmetric traits: A septal aperture was observed on the right humerus, and an acetabular crease was noted on the right os coxa.

Burial 404
Burial Integrity: This intact burial had a small amount of coffin wood preserved.
Burial Description: The individual was interred in a supine and extended position, with the arms along the sides, and hands resting on the upper femora.
Coffin Shape and Dimensions: Hexagonal, length 172 cm, max. width 52 cm

Coffin Hardware: 2 coffin screws, unidentified metal fragments

Coffin Furnishings: None

Burial Clothing Remnants: 3 Prosser buttons, one on upper left chest, one at left femoral head (wrist area), and one along lower right arm bones

Grave Goods: None

Condition of Remains: Bone preservation was fair to good, with nearly all elements represented and many complete. However, the sternum was not recovered, and the ribs were poorly preserved. The occipital squamous and posterior portions of the parietals were completely decomposed.

Age Estimate and Basis: 17.5-21.5 years, based on the development of the mandibular M3s (roots complete). Pubertal stage could not be determined, as all markers were unobservable.

Sex: Male, based on a narrow sciatic notch, pronounced supraorbital torus, and the shape of the mental eminence. Stature calculation using the length of the right femur estimated the individual to be 163.75 ± 3.27 cm tall.

Dental Analysis: All permanent teeth were present and observable. Six maxillary teeth displayed carious lesions. No LEH were observed.

Pathology: Ectocranial porosity was present on the frontal and parietals, along with a rugose "orange peel" texture associated with healed porotic hyperostosis. Periosteal new bone formation was observed on several elements. Slight new bone apposition covered an area about 2 cm superoinferiorly by 1.4 cm mediolaterally on the posterior of the left maxilla superior to M3. Additional periosteal bone formation was noted on the inferior and superior portions (nonarticular surfaces) of the left and right calcanea. These affected areas were about 1.5 cm superior along the posterior lateral talar facet and the central inferior surface. Additional small areas of bone apposition were observed on the left tarsals, excluding the talus. Despite the individual's young age, there was slight degenerative lipping along the posterior margin of both temporomandibular fossae. Slight degenerative changes were noted in the spine, specifically osteophytes and porosity affecting T7 through L5, with the more noticeable changes in the lower thoracic vertebrae.

Nonmetric traits: Traits displayed by this individual include parietal notch bones, a palatine torus, and medial tibial squatting facets.

Burial 416

Burial Integrity: This intact burial had a small amount coffin lid wood preserved, with better preservation of the walls and floor.

Burial Description: The individual was interred in a supine and extended position, with the arms slightly bent, and hands resting on the pelvis (each hand on its corresponding os coxa).

Coffin Shape and Dimensions: Hexagonal, length 180 cm, max. width 47 cm

Coffin Hardware: Ferrous metal coffin lid cross fragments, 4 coffin screws

Coffin Furnishings: None

Burial Clothing Remnants: 4 Prosser buttons (2 along mid-thoracic vertebrae, 1 at right wrist, 1 near lateral to left os coxa)

Grave Goods: None

Condition of Remains: Preservation was fair except for ribs, sternum, right clavicle and scapula, and portions of the os coxae and sacrum, all of which were in poor condition.

Age Estimate and Basis: 15.5-18.0 years, based on the development of the maxillary M3s (root ½ to ¾ complete, 15.5-20.5 years) and lack of fusion of the basilar suture (<18 years). Pubertal stage could not be determined, as all markers were unobservable.

Sex: Indeterminate

Dental Analysis: Post-mortem staining on the anterior teeth and post-mortem enamel breakage prevented some observations. The maxillary and mandibular teeth were all in occlusion except for the unerupted M3s. The maxillary incisors displayed slight shovelling. Small carious lesions were present on three molars, and the mandibular right M2 crown (and most of the root) had been destroyed by caries. A total of 17 LEH were observed on 10 teeth. The defects were positive for two episodes of enamel growth disruption occurring from 1.5 to 2.0 years and 2.0 to 2.5 years. Measurements of two broad bands of pitted defects suggested a period of enamel disruption from 2.5 to 4.5 years of age.

Pathology: Healed cribra orbitalia was present bilaterally. Very slight Schmorl's nodes were noted in two thoracic and two lumbar vertebrae.

Burial 459

Burial Integrity: Burial 459 was disturbed by mechanical stripping and by the growth of particularly large roots, which resulted in the loss of part of the facial skeleton, the distal tibiae and fibulae, and all the bones of the feet.

Burial Description: The individual was interred in a supine and extended position, with the left arm bent, and the wrist resting on the sacroiliac juncture. The right arm was extended along the side, with the hand closed around a rosary.

Coffin Shape and Dimensions: Hexagonal, length indeterminate, width 44 cm

Coffin Hardware: None

Coffin Furnishings: None

Burial Clothing Remnants: None

Grave Goods: Rosary with copper links and black vulcanized rubber beads (pendant portion in right hand and beads draped across proximal right femur shaft)

Condition of Remains: The remains were very poorly preserved due to backhoe and root damage. The maxillae, distal tibiae and fibulae, and foot bones were removed, and the cranium was fragmented by the backhoe. The long bone epiphyses and the left hand were not preserved.

Age Estimate and Basis: Age was difficult to determine, as epiphyses were not preserved and the M3s were not present. Fusion of the metacarpals and hand phalanges indicates an age of greater than 12 years if female, greater than 15 years if male. However, as all cranial sutures (except for the basilar) were completely open, the individual likely had not reached full maturity. A wide age range of 14.0-25.0 years is estimated for this individual. Based on fusion of the hand phalanges, pubertal stage was at least in the post-PHV period.

Sex: Possibly female, based on the absence of an occipital protuberance, small mastoid processes, short stature, and generally gracile elements.

Dental Analysis: One left maxillary fragment including the M1 and M2 was recovered, along with the loose maxillary right M2. A small carious lesion was observed on the occlusal surface of the left M2. All mandibular teeth were present except the third molars, which may have been congenitally absent or unerupted, and the right M2, which had been lost antemortem with the socket partially resorbed. A moderately large carious lesion affected the occlusal and lingual surfaces of the left M2, and there was an associated periapical abscess. The margins of the carious lesion appeared smooth, as if prepared for a dental filling. The lingual surface of the tooth and adjacent occlusal surface were stained green from contact with copper salts. Three teeth exhibited LEH.

Pathology: The endocranial surfaces of the frontal, both parietals, occipital, and both temporals exhibited labyrinthine endocranial lesions. A lytic lesion was observed on the dorsolateral surface of the distal shaft and metaphysis of the right first metacarpal. The lesion had irregular margins extending from the distal articular surface superiorly along the shaft for approximately 6 mm. Sclerotic periosteal new bone was observed surrounding the lesions, and there was slight eburnation on the lateral side of the joint surface, with corresponding eburnation on the articular proximal first phalanx. The phalanx also displayed slight periosteal bone apposition on the dorsal surface of the proximal shaft. Mild periosteal new bone formation was noted on all intact portions of both femoral shafts.

Burial 460A

Burial Integrity: This apparently intact burial had little preservation of coffin wood.

Burial Description: The individual was interred in a supine and extended position, with the arms along the side.

Coffin Shape and Dimensions: Hexagonal, length 190 cm, max. width 50 cm

Coffin Hardware: 1 coffin screw

Coffin Furnishings: Coffin lace, lining fabric

Burial Clothing Remnants: 2 hobnail Prosser buttons (location not noted in field)

Grave Goods: None

Condition of Remains: The remains were in fair to poor condition. The cranium was partially fragmented. Only small fragments of the ribs, vertebrae, hands, and feet were recovered. The sternum, left clavicle, and right os coxa were absent. The ends of the long bones were very poorly preserved when present.

Age Estimate and Basis: Age was difficult to determine, as epiphyses were not preserved and the M3s were not present. The lack of distal contact facets on the M2s suggests the M3s were either unerupted or congenitally absent. Fusion of the right femoral head indicates an age of greater than 14 years if female, greater than 16 years if male, with no upper age limit. However, as all observable cranial sutures were completely open, the individual likely had not reached full maturity. A wide age range of 14.0-25.0 years is estimated for this individual. Pubertal stage could not be determined, as no pubertal markers were observable.

Sex: Possibly female, based on general gracility of elements.

Dental Analysis: All dental remains were loose due to poor preservation of the alveoli. Besides the M3s, the maxillary left P1, maxillary right M1, mandibular left M1 and M2, and mandibular right I1 and M1 were absent. Twenty carious lesions were observed on fourteen teeth, including all maxillary teeth present. Most anterior teeth had damaged crowns, but the only two observable teeth exhibited three LEH.

Pathology: No pathological conditions were observed.

Nonmetric traits: One lambdoidal ossicle was noted.

Burial 582

Burial Integrity: This shallow burial was located just below the modern ground surface, and the cranium was damaged during mechanical stripping.

Burial Description: The individual was buried in a supine and extended position. Arm position is unknown as forearms were not preserved.

Coffin Shape and Dimensions: Hexagonal, length 170 cm, max. width 45 cm

Coffin Hardware: None

Coffin Furnishings: None

Burial Clothing Remnants: 2 Prosser buttons (1 at mid thorax, 1 not recorded in field), 1 cinch buckle (left side of waist)

Grave Goods: None

Condition of Remains: This poorly preserved skeleton consisted of fragmented cranial remains and incomplete long bones.

Age Estimate and Basis: 13.5-17.5, based on ¼ root development of maxillary M3s. Pubertal stage could not be determined as no pubertal markers were observable.

Sex: Indeterminate

Dental Analysis: The anterior teeth, maxillary right molars, and all four M3s were

loose, while the remainder of the teeth were recovered with the alveolus. Small carious lesions were present on two maxillary and six mandibular teeth. Many anterior teeth were unobservable for LEH due to postmortem enamel damage. However, eight enamel defects were noted on seven teeth.
Pathology: No pathological conditions were observed.

Burial 583B
Burial Integrity: This secondary interment consisted of a pile of remains redeposited at the base of the grave shaft of Burial 583A. The remains were likely disturbed from a shallower grave at the time the shaft was dug for the interment of 583A.
Burial Description: Original burial position is unknown. The remains were redeposited in no particular arrangement.
Coffin Shape and Dimensions: N/A
Coffin Hardware: None
Burial Clothing Remnants: 1 Prosser button found among remains
Grave Goods: None
Condition of Remains: The remains representing this individual included an incomplete cranium, a mandible portion, incomplete left and right os coxae, vertebral and rib fragments, and the incomplete shafts of the left and right humeri, femora, and tibiae.
Age Estimate and Basis: Age was difficult to determine, as epiphyses were not preserved and the M3s were not present. The lack of a distal contact facet on the only M2 present suggests the maxillary right M3 was either unerupted or congenitally absent. Lack of dental attrition and completely open cranial sutures suggest the individual likely had not reached full maturity. A wide age range of 14.0-25.0 years is estimated for this individual. Pubertal stage could not be determined, as no pubertal markers were observable.
Sex: Possibly female, based on the width of the sciatic notch and lack of supraorbital tori and mental eminence.
Dental Analysis: All the dental remains were loose and suffered postmortem damage. Recovered teeth included the maxillary left I1 through M1, maxillary right

I1 through M2, and mandibular left and right I1 though P2. Small carious lesions present on maxillary left M1 and mandibular left P1. All 12 anterior teeth had LEH.
Pathology: Healed or healing cribra orbitalia was observed in the left orbit. The right orbit was not present.

Burial 592

Burial Integrity: This intact burial was deeper than surrounding graves.
Burial Description: The individual was buried in a supine and extended position, with the hands folded over one another on top of the right os coxa.
Coffin Shape and Dimensions: Hexagonal, length 166 cm, max. width 43 cm
Coffin Hardware: None
Coffin Furnishings: None
Burial Clothing Remnants: None
Grave Goods: None
Condition of Remains: The cranial remains were nearly complete and most of the postcranial elements were present, though incomplete. Most ribs were represented and all vertebrae but C7 were identifiable.
Age Estimate and Basis: 11.5-14.5 years, based on dental development. The apex was ½ closed on the mandibular premolars, and the mandibular M3 crowns were ¾ complete. All observable epiphyses were unfused. The lack of fusion of the proximal and intermediate phalanges and the iliac crest, and the development of the canines (apex 1/2 closed) indicated the individual was in the acceleration phase of the pubertal growth spurt.
Sex: Indeterminate
Dental Analysis: All permanent teeth were present and in occlusion except for the unerupted M3s. Three mandibular teeth had small carious lesions. A total of 43 LEH were observed on 20 teeth, suggesting six episodes of enamel growth disruption occurring during the following periods: 1.5 to 2.0 years, 2.0 to 2.5 years, 2.5 to 3.0 years, 3.0 to 3.5 years, 4.0 to 4.5 years, and 4.5 to 5.0 years. The distal occlusal margin of the mandibular left M1 appears to have been fractured antemortem.
Pathology: No pathological conditions were observed.

Burial 659

Burial Integrity: This intact burial had heavy root disturbance and very little coffin wood preserved.

Burial Description: The individual was buried in a supine and extended position, with arms extended at the sides, and hands on or lateral to the femora.

Coffin Shape and Dimensions: Hexagonal, length 183 cm, max. width 43 cm

Coffin Hardware: Coffin lid cross fragments

Coffin Furnishings: None

Burial Clothing Remnants: None

Grave Goods: None

Condition of Remains: Bone preservation was fair to poor, with most elements incomplete. The thoracic area was very poorly preserved, represented by only a few rib fragments and no thoracic vertebrae. Few hand or foot bones were recovered.

Age Estimate and Basis: 17.5-19.0 years, based on dental development and epiphyseal fusion. The roots of the M3s were complete (17.5-22.5 years), but the heads and distal epiphyses of the femora and the proximal epiphyses of the tibiae were unfused. In males, this fusion should occur between 16.0 and 19.0 years. Pubertal stage could not be determined, as no pubertal markers were observable.

Sex: Possible male, based on postcranial metrics (though this individual was clearly still growing).

Dental Analysis: The dental remains were in poor condition, with heavy postmortem staining and enamel damage. All teeth were present, but the anterior teeth could not be observed for LEH. No enamel defects were observed on the remaining teeth. No carious lesions were present.

Pathology: No pathological conditions were observed.

Burial 682

Burial Integrity: This intact burial was found immediately north of the east-west road through the cemetery. No wood was preserved from the coffin.

Burial Description: The individual was buried in a supine and extended position, with arms extended at the sides. The hands were not preserved.

Coffin Shape and Dimensions: Hexagonal, length 170 cm, max. width 45 cm

Coffin Hardware: None

Coffin Furnishings: None

Burial Clothing Remnants: None

Grave Goods: None

Condition of Remains: Bone preservation was poor. All elements present were fragmented and incomplete. The sternum, scapulae, clavicles, ribs, sacrum, right patella, right fibula, and hand and foot bones were absent.

Age Estimate and Basis: 13.5-16.5, based on dental development. The apices of the M2s were nearly closed and the roots of the M3s were around ¼ complete. Pubertal stage could not be determined, as no pubertal markers were observable.

Sex: Indeterminate

Dental Analysis: All permanent teeth were present, though the M3s were not erupted. The maxillary left M3 was a peg tooth. A total of 13 EHLs were observed on eight teeth. Their measurements suggested four episodes of enamel growth disruption between 1.0 and 1.5 years, 1.5 and 2.0 years, 2.5 and 3.0 years, and 5.5 and 6.0 years. Three maxillary teeth and two mandibular teeth had small carious lesions, and the maxillary right M1 had a large carious lesion with pulp exposure.

Pathology: Labyrinthine endocranial lesions were observed on fragments of the frontal, both parietals, the right temporal squamous, left zygomatic, and the occipital. In addition to the typical capillary formations, there were extensive patches of white fibre bone deposits on the endocranial surface, of the type more typically seen in younger subadults.

Burial 691

Burial Integrity: This intact burial was found immediately north of the east-west road through the cemetery.

Burial Description: The individual was interred in a supine and extended position, with the arms flexed at a 90° angle and forearms lying across the waist. A small amount of hair was preserved around the cranium.

Coffin Shape and Dimensions: Hexagonal, length 142 cm, max. width 43 cm

Coffin Hardware: 3 coffin screws

Coffin Furnishings: None

Burial Clothing Remnants: 3 Prosser buttons (1 to right of mandible, 1 under left wrist, 1 at proximal end of right femur)

Grave Goods: None

Condition of Remains: The cranium was in fair to poor condition. Of the postcranial skeleton, only seven long bone diaphyses were recovered.

Age Estimate and Basis: 11.5-14.5, based on dental development. The damaged roots of the maxillary M2 were greater than ½ complete, indicating the individual was older than 10.5-13.5 years. The apex of the mandibular P1 was almost closed, indicating an age of 11.5-14.5 years. Pubertal stage could not be determined, as no pubertal markers were observable.

Sex: Indeterminate

Dental Analysis: Most of the dental remains were loose, due to poor preservation of the alveoli. The maxillary left I1 and I2 and all four M3s were missing. An erupted peg tooth was present, but its original position in the dental arcade could not be determined. Small carious lesions were observed on eight maxillary teeth and three mandibular teeth. Additionally, there was one large carious lesion in the mandibular right M1. No enamel defects were noted.

Pathology: No pathological conditions were observed.

Burial 735

Burial Integrity: This deep, intact burial had some preservation of coffin wood.

Burial Description: The individual was interred in a supine and extended position, with the arms bent at a 90° angle and forearms crossed at the waist (right forearm superior to left). A Late Archaic or Early Woodland projectile point made of heat-treated Blanding chert was recovered from the grave fill above the coffin.

Coffin Shape and Dimensions: Hexagonal, length 173 cm, max. width 43 cm

Coffin Hardware: None

Coffin Furnishings: None

Burial Clothing Remnants: 1 wooden button was found just inferior to right lower arm, near the right os coxa.

Grave Goods: None

Condition of Remains: The cranium was intact, and the postcranial remains were in fair to good condition.

Age Estimate and Basis: 12.0-13.5 years, based on epiphyseal fusion and dental development. All observable long bone epiphyses, as well as the tri-radiate complex of the os coxae, were unfused except for the distal humerus, which was fully fused. This pattern suggests an age of 12.0-14.0 years for females, 15.0-16.0 years for males. The apex of the mandibular canine was closed, indicating the individual was at least 12.5-14.5 years. The retention of three dm2s places the individual at the lower end of the range (11.5-12.5 years), though this eruption pattern could be idiosyncratic. The total length of the left femoral shaft and epiphyses was 450 mm, indicating an age of 12.0-14.0 years for males, 12.0-17.0+ years for females.

Despite the individual's young age, pubertal stage was determined to be approaching peak height velocity (PHV), based on the complete formation of the mandibular canine apex.

Sex: Indeterminate

Dental Analysis: The dental remains included both deciduous and permanent teeth. The retained deciduous teeth were the maxillary right di2 through dm2; and the mandibular left and right dm2, both of which had almost completely resorbed roots. The erupted permanent teeth were as follows: the maxillary left I1 through M2; maxillary right I1, I2, M1, and M2; and mandibular left and right I1 through P1, M1, and M2. The mandibular left P2 was partially erupted. Small carious lesions were observed on six permanent teeth. LEH were present on three teeth.

Pathology: No pathological conditions were observed.

Nonmetric traits: There was a cranial shift in the vertebral column with six lumbar vertebrae present. Ossicles were present in the lambdoidal and sagittal sutures. A remnant of the metopic suture was retained above nasion, and a palatine torus was present.

Burial 783

Burial Integrity: The intact burial was only moderately disturbed by a large tree running through the coffin.

Burial Description: Well-preserved coffin wood was identified by a botanist as walnut. The wood retained traces of a dark-coloured undercoat and white paint. The individual in the coffin was buried in a supine and extended position, with the lower arms flexed, left hand resting on the sacrum, and right hand across the right os coxa and sacrum.
Coffin Shape and Dimensions: Hexagonal, length 140 cm, max. width 52 cm; outer crate length 195 cm, width 63 cm
Coffin Hardware: Coffin lid cross, 6 swing bail handles with floral/scroll decoration, 23 cross-shaped decorative tacks, 14 thumbscrews, and escutcheon fragments. Two sets of decorative hinges allowed the coffin lid to be folded towards the feet, exposing the head and shoulders of the deceased.
Coffin Furnishings: Lining tacks, coffin lining fabric
Burial Clothing Remnants: 4 shell buttons (2 at midline on upper chest, 1 inferior to right elbow, 1 found during screening), copper brooch/pin remnant (upper left chest)
Grave Goods: 1 religious medal (illegible) on right scapula
Condition of Remains: The human remains were well preserved, including the unfused epiphyses. Nearly all the elements were present, as was desiccated brain tissue.
Age Estimate and Basis: 15.0-18.0 years, based on epiphyseal fusion. At the time of death, fusion was occurring at the humeral head, distal radius and ulna, ischial tuberosity, distal femur, and proximal tibia. The acromial processes and distal epiphyses of the fibulae exhibited signs of recent fusion, and the calcaneal tuberosity was fully fused. The iliac crest was ossified but unfused, indicating that PHV had been passed and menarche achieved. As the distal radius was fusing at the time of death, the pubertal growth spurt was likely ending.
Sex: Female, based on all sexually dimorphic characteristics of the os coxae and cranium.
Dental Analysis: All permanent teeth were present, though the M3s were unerupted. A large carious lesion destroyed most of the maxillary left M1, leaving the pulp chamber exposed and causing a large periapical abscess. Periosteal new bone formation was present on the buccal surface of the alveolus superior to the

abscess. Additional carious lesions were observed on the maxillary right I1, I2, and P2 and on the mandibular left and right P1s, P2s and M1s. A large periapical abscess exposed most of the right M1 root; periosteal new bone formation was observed on the buccal margins of the abscess. Enamel defects were particularly distinct in this individual's dentition, especially on the anterior teeth. Of the 28 erupted teeth, 25 were marked with LEH, with a total of 46 defects observed. Measurements of these LEH suggested eight episodes of enamel growth disruption occurring between 2.0 and 6.0 years.

Pathology: Labyrinthine lesions were present on the endocranial surface of all the bones of the vault, as well as the sphenoid, and ethmoid. The frontal was the most severely affected, with approximately one-third of the surface covered by capillary impressions.

Nonmetric traits: The second through fourth sternal bodies were only partially fused vertically. Ossicles were present in the lambdoidal suture, and the tibiae displayed medial squatting facets.

Burial 784

Burial Integrity: This burial was disturbed slightly during mechanical stripping, resulting in damage to the maxillae.

Burial Description: The individual was interred in a supine and extended position, with the arms extended along the sides. During decomposition, the cranium rolled posteriorly so that the foramen magnum was facing up at the time of excavation.

Coffin Shape and Dimensions: Hexagonal, length 154 cm, max. width 45 cm

Coffin Hardware: None

Coffin Furnishings: Lining tacks

Burial Clothing Remnants: 1 Prosser button found at midline on the thorax

Grave Goods: None

Condition of Remains: The remains were in fair condition, but the cortical surfaces were not well preserved. The cranial remains were fragmented and incomplete, and most of the epiphyses were not present. The ribs and vertebrae were represented by small fragments, and all hand bones were absent.

Age Estimate and Basis: 13.0-15.5 years, based on dental development. The mandibular M2 and P2 apices were ½ closed, while the apex of the mandibular P1 was almost closed (13.5-15.5 years). The mandibular M3s were between the root initiation and the cleft initiation stages (11.5-18.5 year). Lack of fusion of the femora suggests the individual was younger than 15.0 years if female, less than 18 years if male. Pubertal stage could not be determined, as no pubertal markers were observable.
Sex: Indeterminate
Dental Analysis: The maxillary left I1 through P1 and right I1 through C were lost post-mortem during the mechanical stripping. All mandibular teeth were present, including the unerupted M3s. A small carious lesion was observed on the mandibular left M1. Eight teeth exhibited a total of 16 LEH, which indicated four episodes of enamel growth disruption occurring between 0.5 and 1.0 years, 2.0 and 2.5 years, 2.5 and 3.0 year, and 4.0 and 4.5 years.
Pathology: The area of the popliteal line displayed marked porosity on both tibiae, possibly indicative of some kind of infection or strain to the popliteus muscle.

Burial 817
Burial Integrity: This intact burial had very little wood preserved and very poor preservation of human remains.
Burial Description: The individual was buried in a supine and extended position. The left arm was likely extended along the side, based on the orientation of the preserved left humeral shaft segment.
Coffin Shape and Dimensions: Hexagonal, length 166 cm, max. width 40 cm
Coffin Hardware: None
Coffin Furnishings: None
Burial Clothing Remnants: 1 Prosser button, 2 hooks & eyes (proximal right femur)
Grave Goods: None
Condition of Remains: The remains were very poorly preserved. The cranium consisted of incomplete parietals, temporals, and the occipital as well as over 100 small vault fragments. The postcranial remains included fragments of the os coxae and ribs and the incomplete shafts of the left humerus and both femora and tibiae.

Age Estimate and Basis: 12.0-15.0 years, based primarily on field observations of size. The long bone diaphysis were incomplete and the few teeth recovered had no roots preserved. All observable cranial sutures were open, which indicates a subadult or young adult. Moderately strong development of linea aspera on the left femoral shaft suggests the individual was not a child, while the lack of attrition on the three observable teeth makes it unlikely that the individual was an adult. A rough field estimate of stature placed the individual around 150 cm tall, which is below the average for the cemetery population, even for females. From this height, it is presumed that the individual was nearly adult-sized, but still growing. Pubertal stage could not be determined, as no pubertal markers were observable.

Sex: Indeterminate

Dental Analysis: Four loose teeth were recovered: the maxillary left and right canines and a left molar, and the mandibular left C. All the teeth were in poor condition, the roots damaged or missing (post-mortem). A small carious lesion was observed on the maxillary molar. Dental attrition was very slight. The maxillary and mandibular left canines each exhibited two LEH.

Pathology: No pathological conditions were observed.

Burial 818

Burial Integrity: This intact burial exhibited excellent preservation of wood and bone.

Burial Description: The coffin was well preserved for this cemetery, and traces of red paint and a cream-coloured undercoat were present. The human remains were in excellent condition, due to favourable drainage conditions, as the grave shaft bottomed out on a natural lens of silty sand. The individual was interred in a supine and extended position, with the arms extended along the sides. Post-interment disturbance caused the vertebral column to skew to the right and for the lower half of the remains to be offset from the upper remains toward the right. The femora were rotated outward from the acetabula. Similar disturbance was observed on other well-preserved skeletons interred in the sand lens. The author proposes that this disturbance may have been caused by the 1909 earthquake which damaged the large pillar in nearby Crystal Lake Caverns.

Coffin Shape and Dimensions: Actual coffin shape and dimensions unknown, as excavator did not distinguish between the coffin and the outer container. Outer box length 200 cm, width 68 cm

Coffin Hardware: Viewing pane glass with preserved sealant, coffin lid cross, 6 swing bail handles with cross-shaped lugs, 10 slotted thumbscrews, 10 escutcheons, 24+ decorative star-shaped tacks, 3 urn-shaped caplifters

Coffin Furnishings: Lining tacks

Burial Clothing Remnants: 2 Prosser buttons (2/3 of the way down each tibia), 6 small shell buttons (at midline, extending from mandible to lower lumbar vertebrae), 1 large shell button just superior to the pelvis, 1 silk bow tie at front of neck (without a band encompassing the neck), 1 cotton twill collar piece found against the back of the bow tie (possibly from a back-opening smock-style burial garment)

Grave Goods: None

Condition of Remains: The remains were in excellent condition, and all elements were recovered except for a few hand and foot phalanges.

Age Estimate and Basis: 17.0-20.0 years, based on dental development and epiphyseal fusion. The maxillary M3 root was between ½ and ¾ complete, suggesting an age of 15.5-20.5 years. Active fusion of the humeral head (16.0-21.0 years) and ischial tuberosity (16.0-20.0 years) serves to narrow down the possible age range, as this individual was clearly male. Full fusion of all hand phalanges, recent fusion of distal radius, and active fusion of iliac crest indicate that this individual's pubertal growth spurt was ending.

Sex: Male, based on all sexually dimorphic characteristics of the os coxae and cranium. Stature was estimated to be 166.86 ± 3.27 cm based on the recently fused femora.

Dental Analysis: The dental remains were in good condition. All maxillary teeth were present and in occlusion, except for the unerupted M3s. Some irregularities were noted in the mandible. The left deciduous canine was retained, though the permanent canine had erupted in a position lingual and mesial to the deciduous tooth. The left M2 was either unerupted, congenitally absent, or lost antemortem. There is no distal contact facet on the left M1, but there is a clear molar-sized gap between M1 and the location where damage to the alveolus exposed a small amount of enamel from the unerupted M3. The right mandibular teeth were normal and in occlusion, though there was no space in the dental arcade distal to the M2, suggesting the right M3 was congenitally absent.

Carious lesions were observed on the maxillary M1s and the retained deciduous mandibular canine. A total of 62 LEH were observed on 22 teeth, by far the largest number of defects observed on any individual in the cemetery population. Measurements of these defects suggest nine episodes of enamel growth disruption running continuously from 0.5 to 5.0 years of age.

Pathology: The endocranial surface of the frontal, occipital, left temporal, and right temporal exhibited the early stage of endocranial lesions in the form of small areas of porosity and white fibre bone deposits. Labyrinthine capillary lesions were also present on the left side of the frontal, along with some larger pits resembling arachnoid fovea. A small amount of periosteal new bone formation is present on the alveolus of the left maxilla and mandible. Both femora exhibited slight, active periosteal bone apposition on the posterior surface of the distal shaft and on the neck.

Nonmetric traits: The sacrum exhibited spina bifida occulta. Ossicles were present in the lambdoidal and sagittal sutures. Both tibiae exhibited lateral squatting facets.

Burial 846

Burial Integrity: This burial, which lay immediately below the modern ground surface, was slightly damaged when the right foot bones were disturbed during mechanical stripping. The cranium was fragmented by the weight of heavy equipment.

Burial Description: The individual was buried in a supine and extended position, with arms extended along the sides. Copper salt staining on a fragment of cranium indicates the former presence of an artefact that did not survive.

Coffin Shape and Dimensions: Hexagonal, length indeterminate, max. width 50 cm

Coffin Hardware: None

Coffin Furnishings: None

Burial Clothing Remnants: 1 Prosser button found at midline, mid-thorax. A “bead” reported in earlier publications appears to be rubber attached to a nail, and may be an intrusive object.

Grave Goods: None

Condition of Remains: The remains were in fair to poor condition, with better preservation of the cranium than the postcranial elements. The ends of the long bones were not preserved, and the thorax was represented by fragments.

Age Estimate and Basis: 18.5-22.5 years, based on development of the mandibular M3 (apex ½ closed). Pubertal stage could not be determined, as no pubertal markers were observable.

Sex: Indeterminate

Dental Analysis: The dental remains were in fair condition, with some postmortem staining and enamel breakage. All permanent teeth were present, except the maxillary right M3. One very small carious lesion was present on the occlusal surface of the maxillary right M2. Dental attrition was slight, with no wear on the M3s. The distolingual enamel of the maxillary left M1 was broken antemortem (fracture edges worn smooth). Seven premolars exhibited LEH, suggesting three episodes of enamel growth disruption occurring between 3.0 and 4.5 years.

Pathology: No pathological conditions were observed.

Burial 850

Burial Integrity: This intact burial had little coffin wood preserved.

Burial Description: The individual was buried in a supine and extended position, with the arms extended along the sides. A clay pipe stem fragment was recovered from the grave shaft fill, and was likely related to the original grave shaft digging activity.

Coffin Shape and Dimensions: Hexagonal, length 163 cm, max. width 42 cm; outer crate length 195 cm, width 70 cm

Coffin Hardware: Coffin lid cross fragments, 5 coffin screws

Coffin Furnishings: None

Burial Clothing Remnants: 1 Prosser button (location not recorded in field notes)

Grave Goods: None

Condition of Remains: The remains were in fair to poor condition. The cranial vault was fragmented into three large and numerous small pieces. Most of the postcranial elements were incomplete with the long bone ends missing. The os coxae consisted of only small portions, and the ribs, vertebrae, and scapulae were represented only by fragments. No hand or foot bones were recovered.

Age Estimate and Basis: Age was difficult to determine, due to the lack of long bone epiphyses and M3s. The analyst did not note the root development of the observable permanent teeth, but presumable the apices were closed, suggesting an age of greater than 16 years. However, all observable cranial sutures were open, and attrition was slight on the anterior teeth. The molars and premolars exhibited no dental wear. A broad age estimate of 16.0-25.0 years is proposed for this individual. Pubertal stage could not be determined, as no pubertal markers were observable.

Sex: Possible female, based on sharp orbital margins, small mastoid processes, and smooth glabella.

Dental Analysis: All permanent teeth were present (many loose) except for the M3s, which may have been congenitally absent. Dental attrition was slight, with blunting of the cusps on the anterior teeth only. One small carious lesion was present on the occlusal surface of the maxillary right M1. Post-mortem enamel staining prevented observation of enamel defects on some teeth, but no LEH were noted on the 10 observable anterior teeth.

Pathology: No pathological conditions were observed.

Burial 880A

Burial Integrity: This intact burial had well-preserved coffin wood.

Burial Description: The coffin in this burial was covered by horizontally oriented wooden planks, sometimes referred to as “grave arches.” The protected coffin maintained its structure and was slowly filled with sediment over time. Within the coffin, the well-preserved individual was interred in a supine and extended position, with the arms extended at the sides, and the hands resting on the proximal femora. Burial 880B was offset to the south and west, immediately below the floor of Burial 880A.

Coffin Shape and Dimensions: Hexagonal, length 166 cm, max. width 43 cm

Coffin Hardware: 6 coffin screws

Coffin Furnishings: Lining tacks

Burial Clothing Remnants: 3 Prosser buttons (1 at neck, others at midshaft of left and right radius), 1 copper pin (found during laboratory analysis)

Grave Goods: None

Condition of Remains: The remains were in excellent condition, with nearly all the epiphyses present. The cranial remains were in excellent condition, with the exception of the right lambdoidal suture, which was decomposed from contact with desiccated brain tissue.

Age Estimate and Basis: 13.5-15.0 years, based on dental eruption and development, as well as epiphyseal fusion. All permanent teeth were fully erupted, except for the M3s, which suggests a minimum age of 12.5-13.5 years. The development of the M3s could not be observed as all were still in their crypts, though the alveolus at the location of the left mandibular M3 was just opening for eruption at the time of death. However, the apex of the maxillary P2 was completely closed, suggesting a minimum age of 13.5 years. All long bone epiphyses and the tri-radiate complex of the os coxae were unfused. A female with unfused os coxae is usually14.0 years or younger, while a male would be 16.0 years or younger. Since sex could not be determined, this individual was estimated to be 13.5-15.0 years old. As the distal radius and the epiphyses of the proximal and intermediate hand phalanges were unfused (distal phalanges unobservable), the individual was likely prepubertal or in early puberty.

Sex: Indeterminate

Dental Analysis: The dental remains were in excellent condition and all teeth were present and in occlusion, except for the unerupted, impacted M3s. Carious lesions were present on 12 teeth A total of 18 small to moderate carious lesions were present on 12 teeth, 9 of which were maxillary. Eight teeth exhibited LEH. The maxillary I1s both displayed antemortem enamel chipping at the distal corner of the occlusal surface.

Pathology: No pathological conditions were observed

Burial 913, Individual 2

Burial Integrity: This individual was represented by disturbed, disarticulated remains found in the shaft of intact Burial 913.

Burial Description: The remains of Burial 913, Individual 2, were recovered from the fill above the intact Burial 913 and in the fill surrounding the coffin within the outer box. Most of the elements were found in the western half of the grave and had been placed in no particular arrangement. The remains of this individual were probably disturbed when a grave was dug for Burial 913, Individual 1.

Coffin Shape and Dimensions: N/A

Coffin Hardware: None

Coffin Furnishings: None

Burial Clothing Remnants: None

Grave Goods: None

Condition of Remains: The remains were in good condition, though several elements were missing, including the right clavicle, several bones of the hands and feet, most of the cervical vertebrae, and most of the sternum.

Age Estimate and Basis: 17.0-18.0 years, based on dental development and epiphyseal fusion. The mandibular M3 roots were complete, indicating an age of 17.5-22.5 years. The basilar suture was fusing at the time of death, a process which occurs between 13.0 and 18.0 years in males. The femoral heads were recently fused, but the distal epiphyses were still unfused, indicating the young man was older than 16.0 and younger than 19.0 years. The distal humeri were also unfused; fusion in males usually occurs between 14.0 and 18.0 years. The only pubertal marker observable was the lack of fusion of the iliac crest. However, since the ossification of the crest was unobservable, the pubertal stage could not be determined, other than to say the pubertal growth spurt was not complete.

Sex: Male, based on a narrow sciatic notch, blunt orbital margins, and a prominent mental eminence.

Dental Analysis: All permanent dental remains were present and in occlusion, except for the unerupted maxillary M3s and the partially erupted mandibular M3s. Three small carious lesions were present on the mandibular left M1 and M2 and right M1. A total of 25 LEH were observed on 17 teeth. Measurements of these defects suggest seven episodes of enamel growth disruption occurring between the ages of 2.0 and 6.0 years.

Pathology: Slight to moderate cribra orbitalia was present in both orbits, and appeared to be healed.

Nonmetric traits: Partial spina bifida occulta of the sacrum. One lambdoidal ossicle was observed in the portion of the suture that was present. Two small ossicles were present in the sagittal suture.

Burial 914, Individual 1

Burial Integrity: Individual 1 was intact and undisturbed. Bone from a previous disinterment was found in the fill in the upper layer of the grave shaft, but Individual 1 was found 30 cm below the deepest of the isolated bones.

Burial Description: The individual was interred in a supine and extended position, with the arms slightly flexed, and the hands resting on the pelvis, left over right. A Late Archaic Durst projectile point made of heat-treated Blanding chert was recovered from the grave shaft fill, about 35 cm above the coffin.

Coffin Shape and Dimensions: Hexagonal, length 185 cm, max. width 50 cm; outer crate length 210 cm, width 60 cm

Coffin Hardware: Coffin lid plate fragments (shape indeterminate), 6 coffin screws, 13 dummy screws

Coffin Furnishings: Lining tacks

Burial Clothing Remnants: 2 Prosser buttons (found in screen from soil beneath remains), 1 hook and eye (found with rosary during laboratory processing)

Grave Goods: Rosary with green celluloid plastic beads and a heart-shaped centre medal (laced through fingers of left hand and wrapped around right hand)

Condition of Remains: The remains were in good condition, and most elements were present except for the sternum, coccyx, and a few of the foot phalanges. The ribs were fragmented and incomplete.

Age Estimate and Basis: 15.0-19.5 years, based dental development and epiphyseal fusion. The maxillary and mandibular M3 roots were at a stage between the initiation of the cleft and ¼ complete, indicating an age of 13.5-19.5 years. Recent fusion of the distal tibia and fibula demonstrate this female was probably

15.0 years old or older. At the time of death, the humeral head, distal ulna, and distal femur were all actively fusing, processes which should be complete in females by the age of 19.0 years. As the proximal and intermediate hand phalanges were fused, the distal radius was actively fusing at the time of death, and the iliac crest was still unfused, this individual was likely approaching the end of the pubertal growth spurt.

Sex: Female, based on a wide sciatic notch, sharp orbital margins, smooth glabella, and a lack of prominent external occipital protuberance.

Dental Analysis: All permanent teeth were present and in occlusion except for the unerupted M3s. The left maxillary M3 was a peg tooth. Two teeth, the mandibular M2, had small carious lesions. Five LEH were observed on four teeth, suggesting one episode of enamel growth disruption occurring between 3.5 and 4.0 years.

Pathology: No pathological conditions were observed.

Nonmetric traits: The sacrum displayed spina bifida. The superior two sacral vertebrae had incompletely fused arches, while the inferior two had unfused arches. This individual also exhibited a caudal shift in the spine, having six lumbar vertebrae and only four sacral segments. One ossicle was present at lambda.

Burial 935

Burial Integrity: This intact burial had some coffin wood preserved.

Burial Description: The individual was buried in a supine and extended position, with the arms folded slightly superior to the waist, right arm over left.

Coffin Shape and Dimensions: Hexagonal, length 173 cm, width indeterminate; outer crate length 220 cm, width 78 cm

Coffin Hardware: None

Coffin Furnishings: Lining tacks

Burial Clothing Remnants: None

Grave Goods: None

Condition of Remains: The remains were in fair condition. The cranial remains separated along suture lines and the parietals were warped. The sphenoid and maxillae were fragmented. Few ribs were preserved, and the vertebrae were incomplete. The long bone epiphyses were eroded. Most of the hand and foot bones did not survive.

Age Estimate and Basis: 18.0-20.5 years, based on dental development and epiphyseal fusion. The maxillary M3 roots were ½ to ¾ compete, suggesting an age of 15.5-20.5 years. However, all long bone epiphyses were fused, indicating that this female was likely 18 years old or older. The annular rings of the vertebrae were actively fusing at the time of death. Complete fusion of the distal radius indicates this individual was post-pubertal.

Sex: Female, based on a wide sciatic notch and all sexually dimorphic characteristics of the skull. Stature was estimated to be 155.86 ± 3.72 cm, based on the length of the fully fused right femur.

Dental Analysis: All permanent teeth were present and in occlusion, except for the unerupted M3s. The tooth crowns were notably small for this cemetery population. Fourteen teeth had carious lesions, including large lesions on the maxillary left M1, the mandibular M1s and M2s. A total of 39 LEH were observed on 16 teeth, including all 12 anterior teeth. Measurements of the defects suggest eight episodes of enamel growth disruption occurring between 0.5 and 4.5 years.

Pathology: Mild cribra orbitalia was present in the left orbit.

Nonmetric traits: Nine large lambdoidal ossicles were present.

Burial 971

Burial Integrity: This burial was discovered when wood and coffin nails were exposed at the west end of the outer crate during mechanical stripping. The feature was otherwise undisturbed.

Burial Description: The individual was interred in a supine and extended position, with the arms along the side, and the left hand resting on the left os coxa.

Coffin Shape and Dimensions: Hexagonal, length 187 cm, max. width 49 cm; outer box length 201 cm, width 63 cm

Coffin Hardware: 28 domed copper tacks

Coffin Furnishings: Coffin lining fabric, pillow stuffing made from excelsior

Burial Clothing Remnants: None

Grave Goods: Rosary with wooden beads and a heart-shaped centre medal, draped at midline from superior margin of sternum to lumbar vertebrae.

Condition of Remains: The remains were in fair condition, with most elements represented and most long bone epiphyses intact, despite postmortem erosion of cortical surface. No right hand bones were recovered.

Age Estimate and Basis: 17.5-20.0 years, based on dental development and epiphyseal fusion. The root of the maxillary left M3 was complete, with the apex not quite ½ closed, suggesting an age of 17.5-22.5 years. All observable long bone epiphyses were fused. The anterior inferior iliac spine was actively fusing at the time of death, a process which usually occurs between the ages of 14.0 and 18.0 years in females. The rib heads were also actively fusing, placing the individual between 17.0 and 22.0 years. As the distal radius and all phalanges were fused, and the iliac crest was actively fusing at the time of death, this individual was likely at the end of puberty.

Sex: Female, based on a wide sciatic notch, sharp orbital margins, smooth glabella, and lack of a prominent external occipital protuberance. Stature was estimated to be 159.32 ± 3.72 cm, based on the length of the fully fused left femur.

Dental Analysis: All permanent teeth were present except for the mandibular left M2, which was lost antemortem, and the maxillary left M2 and M3, which may have been lost postmortem. Small carious lesions were present on the maxillary left P2 and right M2, and the mandibular right M1. A smoking pipe notch affected the maxillary left C and P1 and mandibular left I2 and C. Otherwise, dental attrition was very slight. Most of the teeth could not be evaluated for enamel defects due to postmortem enamel damage; no LEH were observed on the intact teeth.

Pathology: Very mild periosteal new bone formation was noted on the distal shaft of the left femur, on the posterior surface immediately superior to the medial condyle. Very coarse woven bone covered an irregular area with a maximum dimension of 20 mm.

Nonmetric traits: C4 and C5 had bifurcated spinous processes. The superior and inferior articular facets on the right side of all the lumbar vertebrae were slightly smaller than those on the left.

Burial 990

Burial Integrity: This intact burial had well-preserved coffin wood.

Burial Description: The individual was buried in a supine and extended position, with the arms along the sides. The right hand lay lateral to the right femur, and the left hand rested across the proximal left femur.

Coffin Shape and Dimensions: Hexagonal, length 186 cm, max. width 45 cm

Coffin Hardware: None

Coffin Furnishings: None

Burial Clothing Remnants: None

Grave Goods: None

Condition of Remains: The cranial remains and long bone shafts were well preserved. The unfused long bone epiphyses, vertebral centra, and most of the hand and foot bones were not preserved.

Age Estimate and Basis: 15.0-16.0 years, based on dental development and epiphyseal fusion. The apex of the maxillary M2 was ½ closed, suggesting an age of 13.5-16.5 years, while the maxillary M3 roots were ¼ to ½ complete, suggesting an age of 13.5-20.5 years. Active fusion of the tri-radiate complex of the os coxae (14.0-18.0 years for males), and of the femoral heads and the proximal tibiae (occurring between 16.0 and 19.0 years) narrows down the age range. The lack of fusion of the intermediate and proximal hand phalanges indicates the individual was either prepubertal or in early puberty.

Sex: Possibly male, based on the sciatic notch. The cranium displayed a mix of male and female characteristic, though this may be due to the individual's young age.

Dental Analysis: All permanent teeth were present and in occlusion except for the unerupted M3s and the mandibular right P2 which was congenitally absent. In its place, the dm2 had been retained. No carious lesions were present. A total of 12 LEH were observed on seven teeth (all anterior). Measurements of these defects suggest three episodes of enamel growth disruption occurring between 1.5 and 2.0 years, 2.0 and 2.5 years, and 2.5 and 3.0 years.

Pathology: No pathological conditions were observed.

Nonmetric traits: Ossicles were present in the lambdoidal suture.

Appendix B

Original Osteological Recording Forms (Blank)

Site ______________	ID # ________________	Page _____ of _____
Fea. # ___________	Date ________________	Age ___________
Bur. # ___________	Recorder ___________	Sex ___________

OSA Burial Project # ___________

INVENTORY

CRANIAL BONES	Left	Right	Single
Frontal			_____
Parietal	_____	_____	
Occipital			_____
Temporal	_____	_____	
Zygomatic	_____	_____	
Maxilla	_____	_____	
Palatine	_____	_____	
Nasal bones	_____	_____	
Mandible			_____
Hyoid			_____
POSTCRANIAL BONES			
Sternum			
Manubrium			_____
Body			_____
Xiphoid			_____
Scapula	_____	_____	
Clavicle	_____	_____	
Innominate	_____	_____	
Sacrum			_____
Coccyx			_____
Patella	_____	_____	
Foot Bones			
Talus	_____	_____	
Calcaneus	_____	_____	
Tarsals	_____	_____	
Metatarsals	_____	_____	
Phalanges	_____	_____	
Hand			
Carpals	_____	_____	
Metacarpals	_____	_____	
Phalanges	_____	_____	

	Left	Right
LONG BONES		
Humerus	_____	_____
Radius	_____	_____
Ulna	_____	_____
Femur	_____	_____
Tibia	_____	_____
Fibula	_____	_____
JOINT SURFACES		
Temporomandibular (cond.)	_____	_____
Temporomandibular (fossa)	_____	_____
Humerus (proximal)	_____	_____
Humerus (distal)	_____	_____
Radius (proximal)	_____	_____
Radius (distal)	_____	_____
Ulna (proximal)	_____	_____
Ulna (distal)	_____	_____
Innominate (acetabulum)	_____	_____
Innominate (sacro-iliac)	_____	_____
Femur (proximal)	_____	_____
Femur (distal)	_____	_____
Tibia (proximal)	_____	_____
Tibia (distal)	_____	_____

SPECIAL CASES

	Left	Right	No. Complete Left	No. Complete Right
Ribs				
1st	_____	_____		
2nd	_____	_____		
3rd-10th	_____	_____	_____	_____
11th	_____	_____		
12th	_____	_____		
Unid	_____	_____		

Vertebrae	Single	No. Complete		Single	No. Complete
C1	_____		T12	_____	
C2	_____		T-unid	_____	_____
C3-6	_____	_____	L-unid	_____	_____
C7	_____		L1	_____	
C-unid	_____	_____	L2	_____	
T1-T9	_____	_____	L3	_____	
T10	_____		L4	_____	
T11	_____		L5	_____	

Site ____________ ID# ______________ Page _____ of _____

Fea. # __________ Date ______________ Age __________

Bur. # __________ Recorder __________ Sex __________

AGE AND SEX Classification

		Stage Left	Stage Right	Developmental Age
Scapula:	Acromion process	____	____	____
	Vertebral margin	____	____	____
	Inferior angle	____	____	____
Clavicle:	Sternal end	____	____	____
	Acromial end	____	____	____
Humerus:	Head	____	____	____
	Distal (trochlea)	____	____	____
	Medial epicondyle	____	____	____
Radius:	Head	____	____	____
	Distal end	____	____	____
Ulna:	Olecranon process	____	____	____
	Distal end	____	____	____
Hand:	Metacarpals	____	____	____
	Phalanges I & II	____	____	____
	Phalanges III	____	____	____
Pelvis:	Primary elements	____	____	____
	Iliac crest	____	____	____
	Ischial tuberosity	____	____	____
Femur:	Head	____	____	____
	G. trochanter	____	____	____
	L. trochanter	____	____	____
	Distal end	____	____	____
Tibia:	Proximal end	____	____	____
	Distal end	____	____	____
Fibula:	Proximal end	____	____	____
	Distal end	____	____	____
Calcaneus:	Epiphysis	____	____	____
Foot:	Metatarsals	____	____	____
	Phalanges I	____	____	____
	Phalanges II	____	____	____
	Phalanges III	____	____	____
Basilar suture		____	____	____

	c	t	l	Age
Vert: Arch fusion	______	______	______	______
Arch to body	______	______	______	______
Epiphyseal rings	______	______	______	______

AGE MARKERS

Dental development ____________ Suchey-Brooks phase ________ Age ________

Dental attrition ________________ Sacro-iliac surface phase ________ Age ________

Epiphyseal ossification ________ Diaphyseal length (subadult) ______________

Cranial sutures ________________

Palatal Sutures ________________

SEX MARKERS

	Male	Female		Male	Female
Supraorbital torus	_____	_____	Sciatic notch	_____	_____
Mastoid process	_____	_____	Subpubic angle	_____	_____
External occip. prot.	_____	_____	Auricular surf.	_____	_____
Chin shape	_____	_____	Pre-auricular sulcus	_____	_____
Eye orbit	_____	_____	Sacral shape	_____	_____

Postcranial:
Over all size _____ _____

Measurements:	M	F		M	F
FEMUR					
circum (>81=M, <81=F)	_____	_____	**SCAPULA**		
head (>45.5=M, <41.5=F)	_____	_____	glenoid cavity ln. (<34=F, >37=M)	_____	_____
length (>446=M, <445=F)	_____	_____	scapula ln. (<129=F, >160=M)	_____	_____
bicond. wd (>78=M, <72=F)	_____	_____	**TALUS**		
TIBIA			max. length (>52=M, <52=F)	_____	_____
circum. at N. F. (F<91.2>M)	_____	_____	**CRANIAL DISCRIMINANT FUNCTION**	_____	_____
proximal breadth (F<74.6>M)	_____	_____	**MANDIBLE**		
distal breadth (F<50.9>M)	_____	_____	gonial angle (<125=M, >125=F)	_____	_____
HUMERUS			**SACRUM**		
head-vert. (>48.76=M, <42.67=F)	_____	_____	sacral index	_____	_____
transv. (>44.66=M, <36.98=F)	_____	_____	depth of curvature	_____	_____
epicond. wd. (>63.89=M, <56.76=F)	_____	_____	ratio of width of body to the ala	_____	_____
RADIUS					
max. transv. distal wd. (>33.99=M, <33.99=F)	_____	_____			
CLAVICLE					
length (>148.00=M, <148.00=F)	_____	_____			

Aging: Cranial Suture Closure (Meindl and Lovejoy 1985)

vault system scoring:

1. midlambdoid ____________________
2. lambda ________________________
3. obelion ________________________
4. anterior sagittal __________________
5. bregma ________________________
6. midcoronal _____________________
7. pterion _________________________

Composite score ________________

lateral-anterior system scoring:

1. midcoronal _____________________
2. pterion _________________________
3. sphenofrontal ___________________
4. inferior sphenotemporal ___________
5. superior sphenotemporal __________

Composite score ________________

Site ____________ ID# ______________ Page _____ of _____

Fea. # __________ Date ______________ Age __________

Bur. # __________ Recorder __________ Sex __________

CRANIAL METRICS L R

Max. Cr. Length (GOL)____________	Vertex Radius (VRR)____________
Max. Cr. Breadth (XCB)____________	Lambda Radius (LAR)____________
Basion-Bregma Ht. (BBH)____________	Bregma Radius (BRR)____________
Porion-Bregma Ht.____________	Nasion Angle (NAA)____________
Basion-Porion Ht. (basion radius BAR)____________	Cranial Base Angle (CBA)____________
Auricular Height____________	Basion Angle (BBA)____________
Min. Frontal Br. (WFB)____________	Biauricular Breadth (AUB)____________
T. Facial Ht.____________	Maximum Frontal Breadth (XFB)____________
U. Facial Ht.____________	Bijugal Breadth (JUB)____________
Bizygomatic Br. (ZYB)____________	Dacryon Radius (DKR)____________
Upper Facial breadth____________	Ectoconchion Radius (EKR)____________
Mastoid length (MDL)____________	Zygoorbitale Radius (ZOR)____________
Nasal Ht.____________	Zygomaxillare Radius (ZMR)____________
Nasal Br. (NLB)____________	Nasion Radius (NAR)____________
Orbital Ht. (OBH)____________	Subspinale Radius (SSR)____________
Orbital Br. (OBB)____________	Prosthion Radius (PRR)____________
Bimaxillofrontale Diam.____________	Frontomalare Radius (FMR)____________
Maxilloalveolar L.____________	Nasion-prosthion ht (NPH)____________
Maxilloalveolar Br.____________	Bimaxillary br (ZMB)____________
Palatal L.____________	Zygomaxillary subt (SSS)____________
Palatal Br.____________	Bifrontal br (FMB)____________
Basion-Nasion L. (BNL)____________	Nasio-frontal subt (NAS)____________
Basion-Prosthion L. (BPL)____________	Biorbital breadth (EKB)____________
Bicondylar Br.____________	Dacryon subt (DKS)____________
Bigonial Br.____________	Frontal chrd (FRC)____________
L. of Ramus____________	Frontal Subt (FRS)____________
Max. Br. Ramus____________	Frontal fract (FRF)____________
Min. Br. Ramus____________	Parietal chord (PAC)____________
Ht. Mand. Body____________	Parietal subt (PAS)____________
L. Mand. Body____________	Parietal fract (PAF)____________
Ht. of Symphysis____________	Occipital (lambda-opisthion) chord (OCC)____________
Brdth mandibular body____________	Occipital (lambda-opisthion) subtense (OCS)____________
Gonial Angle____________	Occipital (lambda-opisthion) fract (OCF)____________
Condyle M-L Length____________	Occipital angle (OCA)____________
Condyle A-P Length____________	Foramen mag L (FOL)____________
Naso-occipital Length (NOL)____________	Foramen mag breadth____________

Site ____________ ID # ______________ Page _____ of _____

Fea. # __________ Date ______________ Age __________

Bur. # __________ Recorder __________ Sex __________

POSTCRANIAL MEASUREMENTS[1]

	Left	Right
Humerus		
Maximum length	_____	_____
Maximum diameter at mid-shaft (Bass)	_____	_____
Maximum diameter at mid-shaft (M-J&J)	_____	_____
Minimum diameter at mid-shaft (Bass)	_____	_____
Minimum diameter at mid-shaft (M-J&J)	_____	_____
Maximum diameter of head	_____	_____
Vertical diameter of head	_____	_____
Transverse diameter of head	_____	_____
Least circumference of shaft	_____	_____
Epicondylar width	_____	_____
Articular width	_____	_____
Radius		
Maximum length	_____	_____
Maximum transverse distal width	_____	_____
Midshaft subperiosteal diameter	_____	_____
AP diameter at mid-shaft	_____	_____
ML diameter at mid-shaft	_____	_____
Ulna		
Maximum length	_____	_____
Physiological length (M-J)	_____	_____
Least circumference of shaft	_____	_____
Dorsovolar diameter	_____	_____
Transverse diameter	_____	_____
Femur		
Maximum length	_____	_____
Bicondylar length	_____	_____
AP diameter at mid-shaft	_____	_____
ML diameter at mid-shaft	_____	_____
Maximum diameter of head	_____	_____
Vertical diameter of head	_____	_____
Circumference of mid-shaft	_____	_____
Subtrochanteric AP diameter	_____	_____
Subtrochanteric ML diameter	_____	_____
Bicondylar breadth	_____	_____

[1] Use Bass except where noted. M-J&J is Moore-Jansen et al.

	Left	Right
Tibia		
Maximum length	______	______
Physiological length	______	______
AP diameter at N.F.	______	______
ML diameter at N.F.	______	______
Circumference at N.F.	______	______
Proximal breadth	______	______
Distal breadth	______	______
Fibula		
Maximum length	______	______
Max. diameter at midshaft	______	______
Talus		
Maximum length	______	______
Calcaneus		
Maximum length	______	______
Middle breadth	______	______
Innominate		
Maximum height	______	______
Maximum breadth	______	______
Pubis length	______	______
Ischium length	______	______
Sacrum		
Maximum anterior height ______		
Maximum anterior breadth ______		
Max. transv. diam. of base ______		
Scapula		
Maximum length	______	______
Glenoid cavity length	______	______
Maximum breadth	______	______
Clavicle		
Maximum length	______	______
Circumference at mid-shaft	______	______
AP diameter at mid-shaft	______	______
Sup.-inf. diam. at mid-shaft	______	______

Site ____________	ID# ____________	Page ____ of ____
Fea.# ____________	Date ____________	Age ____________
Bur.# ____________	Recorder ____________	Sex ____________

NON-METRICS

CRANIAL	Left		Right
1. Epipteric bone - P/A	_____		_____
2. Asterionic bone - P/A	_____		_____
3. Parietal notch bone - P/A	_____		_____
4. Os lambdoidal suture - P/A	_____		_____
5. Os coronal suture - P/A	_____		_____
6. Os sagittal suture - P/A		_____	
7. Os japonicum - P/A	_____		_____
8. Inca bone - P/A		_____	
9. Bregma bone - P/A		_____	
10. Metopic suture - P/A		_____	
11. Supraorbital foramen - F, N, A	_____		_____
12. Pterion shape - A - H	_____		_____
13. Parietal foramen - P/A	_____		_____
14. Superior sagittal sulcus direction - L, R, ?		_____	
15. Mastoid foramen exsutural - PO/PI/A	_____		_____
16. Postcondylar foramen - P/A	_____		_____
17. Hypoglossal canal bipartite - PI/PC/A	_____		_____
18. Foramen ovale incomplete - PI/PC/A	_____		_____
19. Pterygospinous bridge/spur - PI/PC/A	_____		_____
20. Auditory exostosis - P/A	_____		_____
21. Tympanic dehiscence - P/A	_____		_____
22. Multiple infraorbital foramen - P/A	_____		_____
23. Infraorbital suture PI/PC/A	_____		_____
24. Multiple zygomatic foramen - P/A	_____		_____
25. Palatine torus - P/A		_____	
26. Mandibular torus - P/A	_____		_____
27. Mylohyoid bridge - PI/PC/A	_____		_____
28. Multiple mental foramen - P/A	_____		_____

INFRACRANIAL	Left		Right
1. Allen's fossa - P/A	_____		_____
2. Poirier's facet - P/A	_____		_____
3. Plaque -P/A	_____		_____
4. Hypotrochanteric fossa - P/A	_____		_____
5. Trochanteric fossa exostosis - P/A	_____		_____
6. Third trochanter - P/A	_____		_____
7. Medial tibial squatting facet - P/A	_____		_____
8. Lateral tibial squatting facet - P/A	_____		_____
9. Supracondyloid process - P/A	_____		_____
10. Septal aperture - P/A	_____		_____
11. Acetabular crease - P/A	_____		_____
12. Accessory sacral facet - Inn. - P/A	_____		_____
13. Accessory sacral facet - P/A	_____		_____
14. Sacralization of L-5 - P/A		_____	
15. Vastus notch - P/A	_____		_____
16. Vastus fossa - P/A	_____		_____
17. Emarginate patella - P/A	_____		_____
18. Os trigonum - P/A	_____		_____
19. Medial talar facet - P/A	_____		_____
20. Lateral talar extension - P/A	_____		_____
21. Inferior talar articular surface - S/D	_____		_____
22. Anterior calcaneal facet - P/A	_____		_____
23. Peroneal trochlea - P/A	_____		_____
24. Atlas facet form - S/D	_____		_____
25. Transverse foramen bipartite (C3-7)-P/A	_____		_____
26. Atlas posterior bridge - P/A	_____		_____
27. Atlas lateral bridge - P/A	_____		_____
28. Acromial articular facet - P/A	_____		_____
29. Suprascapular foramen - P/A	_____		_____
30. Circumflex sulcus - P/A	_____		_____
31. Sternal foramen - P/A		_____	

Site ____________________ Fea. # __________________ Date __________________ Age _____________ B.P. # ________________

ID# ____________________ Bur. # __________________ Recorder _______________ Sex _______________ Page ________ of ________

			Caries (O, B, L, Int, Root)										Attrition		Enamel defects			
		Status	O	B	L	Int	Root	Pulp Exp.	Alv. Abs.	Artif. Abras.	Hyper-cemen.	Calc.	Attr. deg	Attr. form	Defect type	Defect no.	Defect loc.	Alv. resor.
Max. L	I1																	
	I2																	
	C																	
	P1																	
	P2																	
	M1																	
	M2																	
	M3																	
Max. R	I1																	
	I2																	
	C																	
	P1																	
	P2																	
	M1																	
	M2																	
	M3																	

Mand. L	I1																	
	I2																	
	C																	
	P1																	
	P2																	
	M1																	
	M2																	
	M3																	
Mand. R	I1																	
	I2																	
	C																	
	P1																	
	P2																	
	M1																	
	M2																	
	M3																	

Site ______________ Fea. # ______________ Date ______________ Age ______________ B.P. # ______________

ID# ______________ Bur. # ______________ Recorder ______________ Sex ______________ Page ________ of ________

			Caries (O, B, L, Int, Root)										Attrition		Enamel defects			
		Status	O	B	L	Int	Root	Pulp Exp.	Alv. Abs.	Artif. Abras.	Hyper-cemen.	Calc.	Attr. deg	Attr. form	Defect type	Defect no.	Defect loc.	Devel-opment
Max. L	di1																	
	di2																	
	dc																	
	dm1																	
	dm2																	
	M1																	
	M2																	
	M3																	
Max. R	di1																	
	di2																	
	dc																	
	dm1																	
	dm2																	
	M1																	
	M2																	
	M3																	

Mand. L	di1																	
	di2																	
	dc																	
	dm1																	
	dm2																	
	M1																	
	M2																	
	M3																	
Mand. R	di1																	
	di2																	
	dc																	
	dm1																	
	dm2																	
	M1																	
	M2																	
	M3																	

Site ____________ ID# ______________ Page _____ of _____

Fea. # __________ Date ______________ Age __________

Bur. # __________ Recorder __________ Sex __________

DENTAL METRICS

		MAXILLA			MANDIBLE		
		M-D	B-L	C. ht.	M-D	B-L	C. ht.
I 1	L						
	R						
I 2	L						
	R						
C	L						
	R						
P 1	L						
	R						
P 2	L						
	R						
M 1	L						
	R						
M 2	L						
	R						
M 3	L						
	R						

Deciduous Permanent

Site ____________ ID# ______________ Page _____ of _____

Fea. # __________ Date ______________ Age __________

Bur. # __________ Recorder __________ Sex __________

DENTAL NON-METRICS

		MAXILLA										MANDIBLE								
		1	2	3	4	5	6	7	8	9		1	2	3	4	5	6	7	8	9
I1	L																			
	R																			
I2	L																			
	R																			
C	L																			
	R																			
P1	L																			
	R																			
P2	L																			
	R																			
M1	L																			
	R																			
M2	L																			
	R																			
M3	L																			
	R																			

1. Enamel Pearl
2. Enamel Extension
3. Peg Tooth
4. Carabelli Cusp
5. Shoveling
6. Supernumerary tooth
7. Taurodontic
8. Rotation
9. Crowding

Site ____________ ID # ______________ Page _____ of _____

Fea. # __________ Date ______________ Age __________

Bur. # __________ Recorder __________ Sex __________

ENAMEL HYPOPLASIA MEASUREMENTS

		Maxilla				Mandible			
		1	2	3	4	1	2	3	4
I1	L								
	R								
I2	L								
	R								
C	L								
	R								
P1	L								
	R								
P2	L								
	R								
M1	L								
	R								
M2	L								
	R								

Site ____________ ID# ______________ Page _____ of _____

Fea. # __________ Date _____________ Age __________

Bur. # __________ Recorder __________ Sex __________

PATHOLOGY - 1

		GENERAL							JOINT			
		Gen	Spec	Sev	Loc	State	L/W		Osteo-phytes	Poros	Ebur.	Eros.
Frontal												
Parietal	L											
	R											
Occipital												
Temporal	L											
	R											
Zygomatic	L											
	R											
Maxilla	L											
	R											
Mandible	L											
	R											
C-1												
C-2												
C-3-6												
C7												
T 1-9												
T10												
T11												
T12												
L1												
L2												
L3												
L4												
L5												
Rib 1	L											
	R											
Rib 2	L											
	R											
Rib 3-10	L											
	R											
Rib 11	L											
	R											
Rib 12	L											
	R											

		GENERAL							JOINT			
		Gen	Spec	Sev	Loc	State	L/W		Osteo-phytes	Poros	Ebur.	Eros.
Manubrium												
Sternum body												
Clavicle	L											
	R											
Scapula	L											
	R											
Humerus	L											
	R											
Radius	L											
	R											
Ulna	L											
	R											
Innom	L											
	R											
Sacrum												
Femur	L											
	R											
Tibia	L											
	R											
Fibula	L											
	R											
Patella	L											
	R											
Calcaneus	L											
	R											
Tarsals	L											
	R											
Metatarsals	L											
	R											
Phalanges	L											
	R											
Carpals	L											
	R											
Metacarpals	L											
	R											
Phalanges	L											
	R											

Site ___________		ID# _______________		Page ____ of ____	
Fea. # _________		Date _____________		Age _________	
Bur. # _________		Recorder _________		Sex _________	

PATHOLOGY - 2

		TRAUMA					CUT MARKS	
		Frac.	Sev.	State	Loc.		P/A	No.
Frontal								
Parietal	L							
	R							
Occipital								
Temporal	L							
	R							
Zygomatic	L							
	R							
Maxilla	L							
	R							
Mandible								
C1								
C2								
C3-7								
T-1-9								
T10-12								
L1-3								
L4-5								
Sacrum								
Rib 1	L							
	R							
Rib 2	L							
	R							
Ribs 3-10	L							
	R							
Rib 11	L							
	R							
Rib 12	L							
	R							
Scapula	L							
	R							
Clavicle	L							
	R							

		TRAUMA					CUT MARKS	
		Frac.	Sev.	State	Loc.		P/A	No.
Humerus	L							
	R							
Ulna	L							
	R							
Radius	L							
	R							
Innominate	L							
	R							
Femur	L							
	R							
Tibia	L							
	R							
Fibula	L							
	R							
Patella	L							
	R							
Calcaneus	L							
	R							
Talus	L							
	R							
Tarsals	L							
	R							
Metatarsals	L							
	R							
Phalanges	L							
	R							
Carpals	L							
	R							
Metacarpals	L							
	R							
Phalanges	L							
	R							

Site ________	ID# ____________	Page ____ of ____
Fea. # ________	Date ____________	Age ________
Bur. # ________	Recorder ________	Sex ________

PATHOLOGY - 3

Cribra orbitalia	________	Projectiles		________
Porotic hyperostosis	________	Dislocation		________
Cranial deformation	________	Schmorls:	Cer	________
Osteoporosis	________		Thor	________
Osteochondritis dis.	________		L	________
Spinal anomalies	________	Lig. flav.		________
Sacral anomalies	________			________
Treponemal lesions	________			________
Tuberculosis	________			________
Traumatic death	________			

Comments:

Appendix E

Database Entry Guide

The database developed for this project was formatted as an Excel spreadsheet, with data from each cemetery recorded on a separate sheet. Database columns include the following information, with Columns A through S dedicated to osteological data, and Columns T through CB concerned with mortuary treatment:

Column A: Burial number, including appropriate sub-designations (e.g., A or -1).

B: Age category. All individuals were classified as infants (I, 0-3 years), children (C, 3-12 years), adolescents (12-20 years), or adults (>20 years), following Buikstra and Ubelaker (1994).

C: Sex. All individuals were designated as male (M), female (F), or indeterminate (I). In the interest of simplicity, uncertain sex determinations were entered as positive determinations. For example, an individual listed as “possible male” was coded as “M” rather than “I.”

D: Integrity. This coding deals with the level of disturbance, either recent or historic, to the burial feature. 1=intact or only slightly disturbed, with the coffin and human remains relatively unaffected. 2=significantly disturbed, with up to half of the coffin materials or human remains displaced or absent. 3=redeposited or disinterred remains.

E: Number of erupted teeth observable (for carious lesions). This includes all teeth present which have not been rendered unobservable by taphonomic damage.

F: Number of teeth with carious lesions.

G: Number of anterior teeth observable for linear enamel hypoplasias (LEH).

H: Number of anterior teeth with LEH observed.

I: Total number of LEH observed on individual (anterior teeth only).

J: Cranial remains status. 1=75-100% present. 2=25-75% present. 3=<25% present. 4=single fragment only. 0=absent.

K: Postcranial remains status. 1=75-100% present. 2=25-75% present. 3=<25% present. 4=single element only. 0=absent.

L: Cribra orbitalia and porotic hyperostosis. In this column, coding is restricted to CO, PH, or blanks (absent). The original osteological coding for these pathologies did not consistently include whether the lesions were active or healed at the time of death.

M: Labyrinthine endocranial lesions. Present=1.

N: Nonfocal periosteal new bone formation. In this column, the number of elements affected is recorded for each individual. Isolated periosteal reaction, bone apposition associated with healed fractures, and periosteal bone apposition on the pleural rib surfaces are not included in this column.

O: Tubercular lesions. These include periosteal new bone formation of the pleural rib surfaces (also caused by other chronic pulmonary conditions), as well as lytic lesions of the lower vertebrae. A description of the lesion and the number of bones affected is included in this column.

P: Other pathological observations. This column lists any additional disease- and trauma-related pathologies. Excluded are those caused by age or activity – degenerative joint disease, ossified cartilage, Schmorl's nodes, enthesophytes – and gout, as these conditions are not related to the research questions.

Q: Antemortem trauma. Elements with healed fractures are listed in this column.

R: Perimortem trauma. Elements with unhealed trauma are listed in this column, along with the type of perimortem trauma (fracture, trepanation, cut mark).

S: Cause of death. In rare cases where cause of death can be identified based on pathology, trauma, or historic documentation, it is listed in this column.

T-AI: Buttons. These 16 columns were used for the individual entry of the numbers of buttons in a burial separated into seven types/sizes of plain white Prosser buttons; piecrust, hobnail, and calico Prosser buttons; shell, bone, and wood buttons; metal buttons (sew-through or pad shank); and uncommon buttons.

AJ: Button sum—total number of buttons recovered from burial.

AK-AU: Clothing hardware. These columns were used for the individual entry of the numbers of copper straight pins, shoe buckles, belt buckles, cinch buckles, hooks and eyes (sets), snaps/clasps, collar studs, cuff links, pins/brooches, suspender hardware items, and grommets recovered from each burial.

AV-BG: Clothing accessories. These columns were used for the individual entry of numbers of shoes (partial or complete), shoe leather (fragments only), bowties/neck cloths, hair pins, hair combs, preserved fabric, leather fragments, ribbons, beads (nonreligious), earrings, necklaces, and rings recovered from each burial.

BH: Complex burial outfit? Determination of burial clothing type, based on the presence of clothing fasteners, is given. No=shroud. Yes=day wear.

BI: Religious grave goods presence—yes/no.

BJ-BN: Religious items. These columns were used for the individual entry of numbers of flower wreath remnants, rosaries, chaplets, crosses/crucifixes (not part of rosary or chaplet), and religious medals (not part of rosary or chaplet) recovered from each burial.

BO: Secular grave goods. This column contains the descriptions of nonreligious items not related to clothing, accessories, or coffin construction that were recovered from within the burial container.

BP: Coffin exterior decoration—yes/no.

BQ: Just coffin screws? Yes=coffins with decoration consisting of coffin screws only.

BR: Viewing portal. Entries are recorded for coffin lid hinges (H) and glass viewing panes (VP).

BS-BY: Decorative coffin hardware. These columns were used for the individual entry of numbers of caplifters, coffin lid plates/crosses, coffin handles, coffin screws, thumbscrews, escutcheons, and ornamental tacks/dummy screws recovered from each burial.

BZ: Coffin exterior treatment. This column was used to record features that were rarely preserved, such as traces of paint, varnish, exterior fabric, and, in one instance, sheet-metal covering.

CA-CC: Coffin interior elements. These columns were used for the individual entry of artefacts that provide evidence that a coffin was lined with cloth. These items – coffin lace, tiny lining tacks or large upholstery buttons, and preserved fabric or mattress stuffing – were variably preserved, so they are recorded simply as present (=1).

CD: Comments. Any additional pertinent information is entered in this column, including the name of the deceased in cases of identified individuals and evidence of autopsy or medical dissection.

CE: Burial Type. Based on burial attributes, relatively intact grave features were assigned numbers 1-6, reflecting the simplest to most elaborate mortuary treatment.

Appendix F

Secular Grave Goods Recovered from 10 Nineteenth-Century American Cemeteries

Burial #	Age	Sex	Object	Location	Inclusion type	Interpretation
Second Catholic Graveyard, St. Louis, Missouri, 1824-1850s						
7	40-45 yr	Female	Possible hatchet	Left hip	Intentional	Personal?
Third Street Cemetery, Dubuque, Iowa, ca. 1833-1880						
206-1	17.5-19.5	Female	Scissors	Left of cranium	Intentional	Personal?
361B	16.0-17.5	Male	2 quarter dollars	Eye sockets	Intentional	Folk belief
396	17.0-20.5	Female	Ambrotype photo	Right of cranium	Intentional	Personal
420	Old adult	Male	Harmonica	Under chin	Intentional	Personal
534	Middle-old adult	Male	Pocket knife	Along proximal left femur	Accidental?	Accidental/ personal?
628	Old adult	Male	Half-dime, quarter dollar	Between proximal femora	Accidental?	Accidental/ folk belief?
749	Old adult	Female	Whiteware plate	Left of waistline	Intentional	Folk belief?
Voegtly Cemetery, Pittsburgh, Pennsylvania, 1833-1861						
49	20-30 yr	Female	1833 penny	Pelvis	Intentional/ accidental?	Folk belief/ accidental?
57	23-28 yr	Male	1848 pennies (2)	Eye sockets	Intentional	Folk belief
63	30-35 yr	Male	2 coins, one copper and undated, one unidentified, dated 1828 or 1829	Around left scapula (fell from eyes during coffin lowering?)	Intentional	Folk belief
96	40-45 yr	Male	Ferrous metal box full of sand	Under and to the left of cranium	Intentional	Personal?
100	ca. 16.5 yr	Female	Unidentified orange spherical object and red object	Sphere near left shoulder; red object near hands	Intentional	Personal?
107	1-2 yr	Indet.	2 unidentified coins	Found on upper vertebrae	Intentional	Folk belief
112	40-50 yr	Male	2 illegible pennies (minted 1816-1857)	Eye sockets	Intentional	Folk belief
130	Newborn	Indet.	1837 penny	Near teeth	Intentional	Folk belief

Appendix F., continued.

Burial #	Age	Sex	Object	Location	Inclusion type	Interpretation
174	Infant	Indet.	1845 penny	Along east wall of coffin, middle section	Intentional	Folk belief
189	Infant	Indet.	Painted clay marble	North end of coffin	Intentional	Personal
253	2.5-3.5 yr	Indet.	2 pennies dated 1846 and 1847	Stacked to left of cranium	Intentional	Folk belief
321	45-50 yr	Female	1853 gold dollar	Thoracic area	Intentional	Folk belief
346	23-27 yr	Male	Fragment of paper with German script	Unknown	Intentional?	Personal?
348	27-35 yr	Male	2 pennies, one dated 1847	Eye sockets	Intentional	Folk belief
384	1.5-2.1 yr	Indet.	Copper bell, bone whistle	Lower leg area of coffin	Intentional	Personal/ folk belief?
389	4.7-7.1 yr	Indet.	2 coins, 1 Canadian one-Sou piece (undated), 1 "Hard Times" token	Candian coin found to right of mandible; no provenience for token	Intentional	Folk belief
460	4.0-5.1 yr	Indet.	Pocket knife	Right hand area	Intentional	Personal
496	ca. 10 months	Indet.	2 pennies, dated 1852 and 1853	Found together in lower part of coffin	Intentional	Folk belief
513	Old adult 50+ years	Male	1 or 2 pennies (field notes differ), 1 dated 1844	Eye socket(s)	Intentional	Folk belief
540	32-45 yr	Female	1 penny, minted between 1829-1837	Near left knee	Intentional/ accidental?	Folk belief/ accidental?
574	25-35 yr	Female	1 penny, undated	Near left hip	Accidental/ intentional?	Accidental/ folk belief?
590	17-22 yr	Female	2 pennies, one dated 1841	Eye sockets	Intentional	Folk belief
611	1.5-2.0 yr	Indet.	2 pennies, one dated 1847	Found on either side of cranium	Intentional	Folk belief
739	5.5-7.0 yr	Indet.	2 illegible coins, one dated 1838	Maybe near left hip	Intentional?	Folk belief?

Appendix F., continued.

Burial #	Age	Sex	Object	Location	Inclusion type	Interpretation
Grafton Cemetery, Grafton, Illinois, 1834-1873						
19	Old adult (55+ yr)	Indet.	1853 quarter dollars (2)	Eye sockets	Intentional	Folk belief
138	25-35 yr	Male	3 nickels, dates illegible; pencil lead	2 on eyes, 1 near right hip	Intentional	Folk belief/ personal
154	25-35 yr	Male	1865 coin (penny?)	Near left hip	Accidental?	Folk belief?/ accidental?
183	Infant	Indet.	2 dimes, dated 1839 and 1841	Eye sockets	Intentional	Folk belief
Wells Cemetery, Ooltewah, Tennessee, 1838-1876						
138	Child	Indet.	Possible parasol frame	No info	Intentional?	Personal?
150	Adult	Indet.	Pocket knife	Near cranium	Intentional	Personal
349	Adult	Female	1864 penny	No info	Unknown	Unknown
350	Child	Female?	Porcelain doll	Alongside torso	Intentional	Personal
Alameda-Stone Cemetery, Tucson, Arizona, 1860s-1875						
1113	35-40 yr	Male	Clay poker chip	Under lower torso	Intentional	Personal
1278	35-45 yr	Male	2 unidentified coins	Near cranium	Intentional	Folk belief
1461	25-35 yr	Male	1 unfired and 2 fired percussion caps; 10 unfired percussion caps with remnants of cap box	First group at left hip, second at right hip	Accidental?	Accidental?
1497	20-25 yr	Male	Clay pipe	Near left foot	Accidental?	Accidental?
5476	Newborn	Indet.	Small glass perfume bottle	North side of grave	Intentional	Folk belief
6941	35-45 yr	Male	2 unidentified coins	On and near cranium	Intentional	Folk belief
8844	Fetal-newborn	Indet.	Picture frame	In hands	Intentional	Personal
8877	18-35 yr	Male	Scissors	Below left hip	Intentional	Personal?
8897	18-22 yr	Male	Pulley ring	Between feet	Intentional	Unknown
9907	35-50 yr	Male	Metal-framed photograph	On left shoulder	Intentional	Personal
13322	50-60 yr	Male	Unidentified coin	Lower torso	Intentional	Folk belief?
13337	30-40 yr	Female	Metal picture frame	On torso	Intentional	Personal
16625	Fetal-newborn	Indet.	Silver coin	To left of cranium	Intentional	Folk belief

Appendix F., continued.

Burial #	Age	Sex	Object	Location	Inclusion type	Interpretation
16989	35-50 yr	Female	Metal picture frame	On torso	Intentional	Personal
18676	Fetal-newborn	Indet.	Rhinestone brooch	In hands	Intentional	Personal
18722	3-4 yr	Indet.	Metal picture frame	On torso	Intentional	Personal
18723	40-65 yr	Male	Marble or glass ball	In grave fill	Accidental?	Accidental?
18893	35-50 yr	Female	Metal picture frame	On torso	Intentional	Personal
18922	20-25 yr	Male	Spent cartridge case, flint-and-steel	Near left hip	Accidental?	Accidental?
19566	10-11 yr	Indet.	Metal picture frame	On torso	Intentional	Personal
19587	1.5-2 yr	Indet.	Metal picture frame	On torso	Intentional	Personal
19779	<4 mos.	Indet.	Small glass bottle	Near left arm	Intentional	Folk belief
19822	45-55 yr	Male	Slate stylus	Unknown	Accidental?	Accidental?
19890	1.5-2 yr	Indet.	Egg shell	Between lower legs	Intentional	Folk belief?
21579	20-30 yr	Female	Metal picture frame	Under torso	Intentional	Personal
21614	1-2 yr	Indet.	Small glass bottle	Near right elbow	Intentional	Folk belief
21653	30-40 yr	Female	Metal picture frame	On torso	Intentional	Personal
21840	20-25 yr	Male	6 silver coins	At right hip	Accidental	Accidental
21844	40-50 yr	Female	Tintype photo in frame	Near hands	Intentional	Personal
25185	35-55 yr	Indet.	Picture frame	On torso	Intentional	Personal
28509	40-99 yr	Male	Picture frame	Near right elbow	Intentional	Personal
28582	40-50 yr	Male	Metal picture frame	Unknown	Intentional	Personal
28677	11-12 yr	Indet.	Metal picture frame	On torso	Intentional	Personal
28681	40-55 yr	Female	Drawing in a metal picture frame	Near hands	Intentional	Religious?

Appendix F., continued.

Burial #	Age	Sex	Object	Location	Inclusion type	Interpretation
28765	35-50 yr	Male	Bone comb; package with copper rifle cartridge, 20 percussion caps, strike-a-light set, newspaper and rope fragments	Comb under right hip; package under left hip	Intentional	Folk belief
Freedman Cemetery, Dallas, Texas 1869-1907						
17	1.9 yr	Indet.	Shield nickel (1867-1883)	Upper right chest	Intentional	Folk belief
22	30-40 yr	Male	Glass vial	Left jacket pocket	Intentional	Folk belief
32	40-50 yr	Female	1 Seated Liberty dime, 1 nickel (both perforated)	Found with cranium	Intentional	Folk belief
37	Newborn	Indet.	Doll	In grave fill	Intentional	Personal
41	4.4 yr	Indet.	Toy teacup	In grave fill	Intentional	Folk belief
42	30-40 yr	Indet.	Spoon	Upper left chest	Intentional	Folk belief
54	40-50 yr	Male	Pencil	At left hip	Accidental	Accidental
65	30-40 yr	Male	Matches, screwdriver	At left hip	Accidental	Accidental
85	5.6 yr	Indet.	Doll	Along upper left arm	Intentional	Personal
86	20-30 yr	Male	Pencil	At right hip	Accidental	Accidental
101	Newborn	Indet.	Glass vase fragment	On coffin lid	Intentional	Folk belief
108	30-40 yr	Female	Cologne bottle, comb, brush, mirror	Near left upper arm	Intentional	Folk belief
110	16.6 yr	Female	Doll	Along upper right arm	Intentional	Folk belief?
121	1.4 yr	Indet.	Rattle	Over pelvis	Intentional	Personal
123	2.2 yr	Indet.	1853 Seated Liberty dime, perforated	Near cranium	Intentional	Folk belief
147	6.3 yr	Indet.	Cologne bottle; book, cap gun, 2 marbles	On coffin lid	Intentional	Folk belief; personal
158	20-30 yr	Female	Dice	Near right hip	Intentional?	Personal?
218	30-40 yr	Female	Envelope	In one hand	Intentional	?
230	Middle adult	Male	Porcelain vessel	Unknown	Intentional	Folk belief

Appendix F., continued.

Burial #	Age	Sex	Object	Location	Inclusion type	Interpretation
264	40-50 yr	Female	Coin purse (empty)	At left elbow	Intentional	Folk belief/ personal?
314	7.4 yr	Indet.	Toy teacup	Outside coffin	Intentional	Folk belief
315	1.2 yr	Indet.	Doll	Crook of right arm	Intentional	Personal
320	14.5 yr	Female	Doll	Near right foot	Intentional	Folk belief?
326	30-40 yr	Female	Teapot	On coffin lid	Intentional	Folk belief
327	30-40 yr	Male	1857 and 1860 Seated Liberty half-dimes (one perforated); disinfectant bottle	All items near feet	Intentional	Folk belief
331	40-50 yr	Male	Pencil	To left of cranium	Intentional	Personal?
343	1.4 yr	Indet.	Single shoe	On coffin lid	Intentional	Folk belief
347	2.0 yr	Indet.	1853 Seated Liberty dime, perforated	At neck	Intentional	Folk belief
358	20-30 yr	Indet.	Vase, moustache cup, servingware	On coffin lid	Intentional	Folk belief
383	30-40 yr	Female	3 perforated Seated Liberty half-dimes (two 1856)	At neck	Intentional	Folk belief
389	Adult	Male	Pocket knife	In left hand	Intentional	Personal
425	7.5 yr	Indet.	Bowl	Left pelvis	Intentional	Folk belief
451	Newborn	Indet.	Glass egg	Near left knee	Intentional	Folk belief
466	14.5 yr	Male	1898 penny	Lower body	Intentional	Folk belief
529	Middle adult	Male	Pencil	At left hip	Accidental	Accidental
533	30-40 yr	Female	Token	Between knees	Intentional	Folk belief
549	0.7 yr	Indet.	1857 Seated Liberty half-dime and 1877 Seated Liberty dime, perforated	At neck	Intentional	Folk belief
550	1.1 yr	Indet.	Marble	On coffin lid	Intentional	Personal
563	30-40 yr	Male	1897 Barber quarter-dollar	Near hip	Intentional	Folk belief
588	20-30 yr	Male	Pencil	Near left elbow	Intentional?	Personal?

Appendix F., continued.

Burial #	Age	Sex	Object	Location	Inclusion type	Interpretation
600	50+ yr	Male	Pocket knife and coin purse	Near left hip	Accidental?	Accidental?
608	1.8 yr	Indet.	1857 Seated Liberty dime, perforated	At neck	Intentional	Folk belief
650	Middle adult	Female	Key	At neck	Intentional	Folk belief?
657	30-40 yr	Male	Shield nickel (1867-1883)	Near shoes	Intentional	Folk belief
658	40-50 yr	Indet.	Shield nickel (1867-1883)	Near cranium	Intentional	Folk belief
801	20-30 yr	Female	Coin purse (empty)	Upper body	Intentional?	Folk belief/ personal?
833	Adult	Male	1895 Barber quarter-dollar	Near right hip	Intentional	Folk belief
838	Newborn	Indet.	Glass bottle	To left of cranium	Intentional	Folk belief
856	4.8 yr	Indet.	Doll	Along upper left arm	Intentional	Personal
859	19.4 yr	Indet.	Doll	On coffin lid	Intentional	Folk belief?
871	30-40 yr	Female	Pocket knife	In crook of left arm	Intentional	Personal
881	0.3 yr	Indet.	1829 half-dime, perforated	At neck	Intentional	Folk belief
909	Newborn	Indet.	Whiteware saucer; two medicine bottles	On coffin lid; at head and foot of coffin	Intentional	Folk belief
913	0.9 yrs	Indet.	1878 Seated Liberty dime, perforated	On upper chest	Intentional	Folk belief
929	20-30 yr	Male	Medicine bottle	Over left hip	Intentional	Folk belief
1002	30-40 yr	Male	7 coins, incl. 5 nickels, 1 penny, 1 modified dime	Over left hip	Intentional	Folk belief
1003	7.5 yr	Indet.	Doll	On abdomen	Intentional	Personal
1004	40-50 yr	Female	Spoon	On upper left chest	Intentional	Folk belief
1026	30-40 yr	Female	Pocket knife	Over right hip	Intentional	Personal
1030	30-40 yr	Female	Puzzle coin	Unknown	Intentional	Folk belief
1034	30-40 yr	Male	Bowl	Under right os coxa	Intentional	Folk belief
1042	20-30 yr	Female	Shield nickel (1867-1883)	To left of cranium	Intentional	Folk belief

Appendix F., continued.

Burial #	Age	Sex	Object	Location	Inclusion type	Interpretation
1055	Newborn	Indet.	Medicine bottle	Along upper left arm	Intentional	Folk belief
1092	30-40 yr	Female	Medicine bottle	Between femora	Intentional	Folk belief
1114	30-40 yr	Female	1840 Seated Liberty dime	Near cranium	Intentional	Folk belief
1120	5.9 yr	Indet.	Doll; 5 medicine bottles, 1 Florida water bottle	On upper left chest; between lower legs	Intentional	Personal; folk belief
1126	19.0 yr	Male	Plate	On coffin lid	Intentional	Folk belief
1147	40-50 yr	Male	1857 and 1877 Seated Liberty quarter-dollars	Near cranium	Intentional	Folk belief
1177	0.6 yr	Indet.	1842 Seated Liberty dime	Near cranium	Intentional	Folk belief
1226	1.2 yr	Indet.	1853 Seated Liberty dime, perforated	At neck	Intentional	Folk belief
1234	20-30 yr	Male	Pencil	Over right hip	Accidental	Accidental
1252	20-30 yr	Female	Perfume bottle	In crook of right arm	Intentional	Folk belief
1285	40-50 yr	Male	Walking cane	Alongside right hip	Intentional	Personal
1307	30-40 yr	Female	2 Seated Liberty quarter-dollars	Beneath chin	Intentional	Folk belief
1308	30-40 yr	Male	Two 1854 Seated Liberty quarter-dollars	One below right shoulder	Intentional	Folk belief
1326	Newborn	Indet.	Medicine bottle	At feet	Intentional	Folk belief
1330	30-40 yr	Male	Pocket knife	In left hand	Intentional	Personal
1337	0.5 yr	Indet.	1876 Seated Liberty dime, perforated	On upper chest	Intentional	Folk belief
1340	1.5 yr	Indet.	1853 Seated Liberty half-dime and 1855 Seated Liberty dime, perforated	At neck	Intentional	Folk belief
1391	0.6 yr	Indet.	Rattle	Near right upper arm	Intentional	Personal
1397	18.5 yr	Female	Doll, pocket knife, coin purse; medicine bottle	Around thorax	Intentional	Personal; Folk belief

Appendix F., continued.

Burial #	Age	Sex	Object	Location	Inclusion type	Interpretation
1400	0.8 yr	Indet.	Toy chamber pot and basin	Near right shoulder	Intentional	Folk belief
1415	0.4 yr	Indet.	2 nickels	Unknown	Intentional	Folk belief
1422	40-50 yr	Male	Pocket knife	Unknown	?	Personal?
1453	0.6 yr	Indet.	Marble	On coffin lid	Intentional	Personal
1486	Newborn	Indet.	1898 Liberty nickel and undated nickel	Near cranium	Intentional	Folk belief
1507	Adult	Female	1856 Seated Liberty half-dime, 1889 Seated Liberty dime, perforated	Near ankles/feet	Intentional	Folk belief
Avondale Burial Place, Bibb County, Georgia, 1869-1935						
31	25-35 yr	Male	Clay smoking pipe	Near cranium	Intentional	Personal
34	ca. 3 yr	Indet.	Porcelain doll and perforated 1837 half dime	Doll in left arm; coin at neck	Intentional	Personal; folk belief
38	20-25 yr	Male	0.32 caliber lead bullet	Beside right fibula	Intentional?	Folk belief?
56	Neborn	Indet.	Glass apothecary pestle	Left arm location	Intentional	Folk belief?
62	Adult? Based on bone size	Female	Plastic lice comb	Near right hip	Accidental/ Intentional?	Accidental/ personal?
67	<5 yr	Indet.	2 undated shield nickels (minted 1866-1883)	Eye sockets	Intentional	Folk belief
68	<1 yr	Indet.	2 pennies, dated 1878 and 1880	Eye sockets	Intentional	Folk belief
86	40-50 yr	Indet.	Perforated “Hard Times” token from 1840 presidential campaign	At neck	Intentional	Folk belief
94	ca 1.5 yr	Indet.	Remnants of a chatelaine-style coin purse (no coins)	No provenience recorded	Intentional	Folk belief/ personal?
Dove Cemetery, Atascadero, California, 1870s-1890s						
15/16	30-40 yr	Male	1893 Barber dime, graphite pencil lead	Mixed with burned remaind	Accidental	Accidental

Appendix F., continued.

Burial #	Age	Sex	Object	Location	Inclusion type	Interpretation
Milwaukee County Poor Farm Cemetery, Wauwatosa, Wisconsin, 1882-1925						
10007	<1 yr	Indet.	Ceramic angel pin	Left shoulder	Intentional	Religious
10093	18-22 yr	Male	Woman's shoe	Near cranium	Intentional	Folk belief
10298	Middle adult	Male	1906 nickel	Unknown	Intentional	Folk belief
10305	Old adult	Male	Pencil	Unknown	Accidental	Rubbish
10466	Old adult	Male	Coin purse (empty)	Unknown	Accidental	Accidental
10480	Old adult	Male	1905 penny	Near vertebrae	Accidental	Accidental
10525	Adult	Indet.	Kaolin clay pipe	Near left forearm	Accidental	Rubbish
10528	Middle adult	Male	Pencil	Unknown	Accidental	Accidental
10622	Old adult	Indet.	Wooden pipe stem, circular tin with nails and screws	Unknown	Accidental	Accidental
10709	Middle adult	Male	1903 dime	Near left scapula	Intentional	Folk belief
10736	Middle adult	Male	2 wooden smoking pipes and a pencil	Alongside fibulae	Intentional	Personal possessions
10848	Adult	Male	Pencil	Below ribs	Accidental	Rubbish
10881	15-18 yr	Indet.	Iron skeleton key	On left ribs	Accidental	Rubbish

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Figure 1.3 Aerial photograph of the Third Street Cemetery, showing graveyard boundaries, 2007-2011 project area, and locations of excavated burials.

Figure 2.5 Rose caplifters recovered from Burial 868, Third Street Cemetery.

Figure 2.10 "Guardian Angel" medal recovered from Burial 868, Third Street Cemetery.

Figure 2.11 Wood-bead rosary recovered from Burial 715B, Third Street Cemetery

Figure 2.12 Ebony and copper crucifix found in Burial 96, Third Street Cemetery

Figure 3.3 Aerial photograph of the Third Street Cemetery with the boundary lines of the original cemetery lot, Outlot 723, and project area superimposed.

Figure 7.4 Enamel hypoplasias, left lateral view of the mandible from Burial 818, which held a 17.0-20.0- year-old male.

Figure 7.5 Cribra orbitalia, inferior view of the frontal from Individual 2, Burial 913 (male, 17.0-18.0 years).

Figure 7.6 Endocranial lesions of the frontal from the individual in Burial 783 (female, 15.0-18.0 years).

Figure 7.7 Close-up of the penetrating lesion that destroyed the auricular surface of the left os coxa of the adult found in Burial 977.

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Figure 7.8 Unhealed trepanation on the right parietal of the middle-aged male in Burial 152.

Figure 7.9 Tibiae from the 18.5-22.5-year-old male in Burial 302, exhibiting periosteal new bone formation.

Figure 7.10 Endocranial pitting on the frontal of the young man in Burial 302.

Figure 7.11 Three left ribs from the adolescent female (17.5-19.5 years) in Burial 206, with woven bone apposition on the pleural surface.

Figure 7.12 Endocranial lesions of the frontal from Burial 818.

Figure 7.13 Calcanei from the 15.0-19.0-year-old female in Burial 255.

Figure 9.2 Aerial photograph of the Third Street Cemetery.

Figure 9.3 Map showing the locations of adolescent burials within the excavated portion of the Third Street Cemetery.

Figure 9.4 Close-up image of the adolescent female in Burial 206-1, with large scissors to the left of her head.

Figure 9.5 Close-up image of the adolescent female in Burial 396, with a framed ambrotype photograph to the right of her head.

Figure 9.6 Close-up image of the adolescent male in Burial 361B, with Seated Liberty quarter dollars on his eyes.

Figure 9.7 Close-up image of the old adult female in Burial 749, with a whiteware plate near her left hip.

Figure 9.8 Detail image of the old adult male in Burial 420, with a harmonica near his mandible.

Figure 9.9 Close-up image of the middle-aged to old adult male in Burial 534, with a pocketknife in his left trouser pocket.

Figure 9.12 Field photograph of the 13.0-14.5-year-old female in Burial 349A, showing the large coffin lid cross and other decorative hardware.

Figure 9.13 Photograph showing the buttons and remnants of beaded leather shoes found in Burial 349A at top, with ring, wreath wire, religious medal, and rosary fragments at bottom.

Figure 9.15 Coffin handles from five burials at the Third Street Cemetery with similar, red-painted coffins.

Figure 9.16 Field photograph of the remains of John Joseph Blake in his cast iron coffin.

Figure 9.17 Field photograph of the brown silk bow tie in situ in Burial 818.

Figure 9.18 Close-up photograph of the silk bow tie and collar fragment from Burial 818.

Figure 9.19 Close-up photograph of the underside of the silk bow tie from Burial 818.

Figure 9.20 Apparel-related artefacts from Burial 818.

Figure 9.21 The crudely-sewn collar piece from Burial 818.

Figure 9.22 Close-up field photograph showing the mismatched Prosser buttons found at mid-calf in Burial 818.

Figure 9.23 Close-up photograph of artefacts found in Burial 24.

Figure 9.24 Close-up photograph of collar stud found in Burial 71, the grave of a 15- to 18-year-old male.

Figure 9.25. Photograph of 28 metal buttons and one Prosser button recovered from Burial 71.

Figure 9.26. Close-up photograph of artefacts found in Burial 361B.

Figure 9.28 Close-up photograph of fabric embellished with glass seed beads in the shape of a heart, Burial 206-1.

Figure 9.29 Field photograph showing the fabric preserved in Burial 206-1.

Figure 9.30 Close-up photograph of ribbon adhered to the viewing pane from Burial 206-1.

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Hi Jennifer,

Congrats on the dissertation progress! You may use the photos just please note "photographs taken with permission of the UWM Archaeological Research Laboratory and the Milwaukee County Poor Farm Cemetery Project.

Looking forward to seeing the final version of the dissertation.

Best,

Pat

Patricia B. Richards, Ph.D.
pronouns: she/her/hers
Senior Scientist, Dept. of Anthropology
University of Wisconsin-Milwaukee
Adjunct Curator - Milwaukee Public Museum
pbrownr@uwm.edu

"We late-lamented, resting here,
Are mixed to human jam,
And each to each exclaims in fear,
'I know not which I am!'

"Where we are huddled none can trace,
And if our names remain,
They pave some path or p-ing place
Where we have never lain!

from The Levelled Churchyard
Thomas Hardy 1882

From: Mack, Jennifer E <jennifer-mack@uiowa.edu>
Sent: Wednesday, January 22, 2020 1:16 PM
To: Patricia B Richards <pbrownr@uwm.edu>
Subject: Photo permission

Hi Pat,

I think I'm coming down the home stretch on my dissertation now—I'm planning to have a complete first draft ready for my advisers by May. Hooray! The chapter I'm working on now includes some of the pathology observations from the MCPFC teenagers, and there are two photos I took during my visit that I'd like to use in my dissertation (see attached), if you don't mind. Do you have a standard photo permission form for the collection that I need to fill out?

Thanks!
Jennifer

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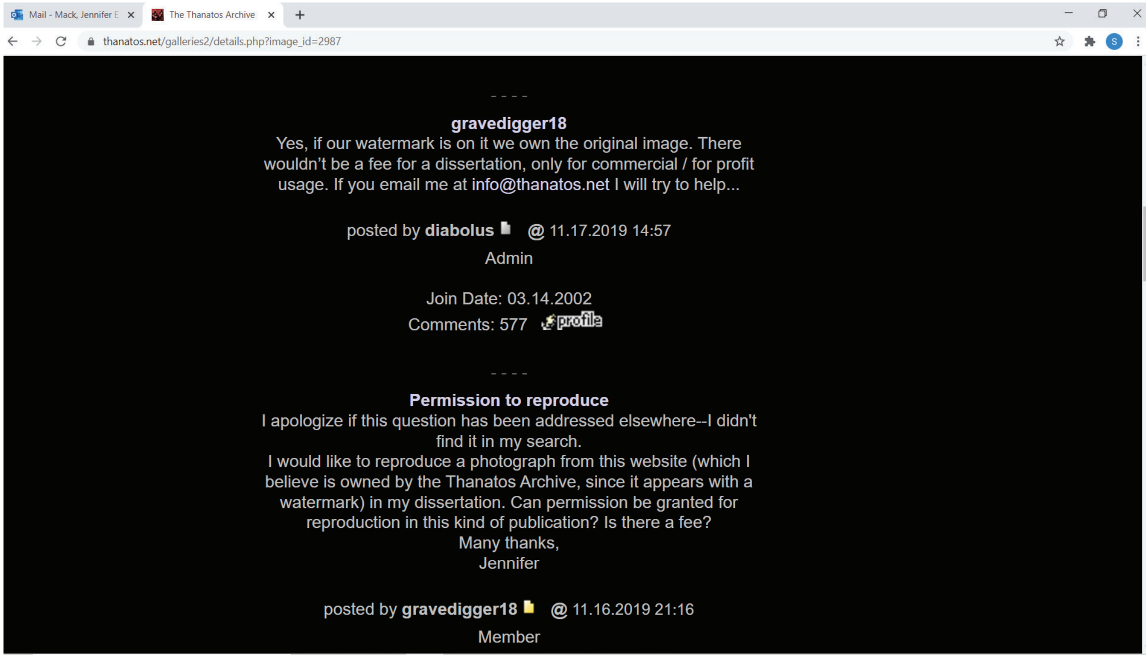
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Hello!

This is gravedigger18 (a.k.a. Jennifer Mack). I'm a PhD student at the University of Exeter (though I live in the US and work at the University of Iowa). Part of my dissertation deals with the mortuary treatment of adolescents in 19th century America. I've attached a research abstract, in case you want more details. Anyway, I would like to request written permission to reproduce an image from the Thanatos Archive collection in my dissertation, which has a submission deadline of September 30, 2020 (though I would like to finish a little early!). After revisions, the dissertation will be available to researchers through the University of Exeter as well as through Proquest. It will also be "published" by the Office of the State Archaeologist at the University of Iowa as part of their Research Paper series--again, not for profit and no hard copies, just a digital file in the archives available to researchers.

Doing a little more brainstorming overnight, I realized that there are actually 4 images I would like to use in the dissertation, if that's permissible. The titles are Painted Backdrop, Teen Boy, Brooklyn Boy, and Magnifying Glass. Can you send me digital files of those images please? Or is there some way to unlock a downloading function on the website once I have permission?

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Hi!

I can probably email you the files.. I say probably because I don't have unwatermarked, ready to go scans of every image in the archive on this computer; the masters of newer images (the first 25 or so pages of the website) have a much higher chance of being available without needing to be re-scanned fresh.

Anyway, first I guess I should ask you to please confirm that these are the images you are interested in:

https://www.thanatos.net/galleries2/details.php?image_id=1722
https://www.thanatos.net/galleries2/details.php?image_id=3496 (There are four images titled "Teen Boy".. I selected the most recent)
https://www.thanatos.net/galleries2/details.php?image_id=2791 (Brooklyn Boy.. I was surprised to see a camera photo of this one, and not a scan! I'm not sure his image has ever been scanned, to be honest.. but I will look)
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Once confirmed, I will take a look to see if I have the clean scans around. Also, as far as the dimensions of the files.. is max of 900 x 900 pixels (approximately the size of "Teen Boy" as seen on the site) acceptable?

Thanks,
Jack Mord

Exchange on Facebook, March 20, 2020. Photograph originally posted on the page of the Victorian Post-Mortem Photography group (private).

Paul Scalcini I am writing a PhD dissertation which deals, in part, with elaborate funerals given to teenagers in the Victorian period. I would love to get your permission to use this photograph (with full credit given to you) in my paper. Could you send me a private message so we can discuss it? Thanks!

Jennifer,saw your comment on my post. Of course you can use the photo. This is another one from Marie. This one wasn't colorized.

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