Understanding Violence in Medieval London: An Examination of the Skeletal Evidence

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ABSTRACT

It is often presumed that the medieval period was an exceptionally violent one. But, previously, this idea has predominately been based on historical evidence of violence. As this data is subject to numerous biases based on past perception of what connoted criminally violent behaviour, this assumption of excessive medieval violence can be called into question. This study attempts to rectify this problem by adding evidence of violence from the skeletal record, helping to create a more well-rounded picture of medieval violence. In total, data from over 6,000 skeletons, representing six different sites from medieval London, were analysed for evidence of violence-related injuries. The skeletal evidence was then interpreted using an approach that integrates both the historical evidence and cultural patterns of violence. The overall findings suggest that violence was prominent and affected all aspects of medieval London society, but how that violence was characterised depended on an individual's sex, age, social status, and century of life.

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CHAPTER 1: INTRODUCTION

Modern portrayals of the medieval period depict it as a time of considerable violence. From the excruciating execution scene of William Wallace in *Braveheart*, to the frequent gory deaths in *Game of Thrones*, to even the comedic blood spurting out of the limbs of the Black Knight in *Monty Python and the Holy Grail*, media representations of the Middle Ages are all rather gruesome. These images have contributed to the popular assumption that the medieval era was particularly "barbaric and bloodthirsty" (Tracy, 2012: 12). McGlynn (2008) supports this by suggesting that "a common perception of the Middle Ages is that society was brutalized by constant violence…". But how accurate is this perception? Are all these media portrayals just examples of dramatic license? Or did the medieval population really savour violence?

To begin to answer these questions we must first understand that there is a fundamental difference in the acceptance of violence between the medieval period and now. Today, violence is recognised as a preventable threat to humanity that can be controlled and reduced through the implementation of the right campaigns and policies (Krug *et al.*, 2002). To an extent, it is seen as an aberrant behaviour incongruent with civilised society (Ahlström and Molnar, 2012: 32-33; Chagnon, 2013; Wade, 2014). This is a uniquely modern view, one that has likely come about through a combination of factors: mainly, the increasing legitimacy of the world's legal systems, the general decrease in violent

behaviour worldwide, and the subsequent 'sensitization' of violence (Cooney, 1997; Eisner, 2003; Gurr, 1981).

Historically, violence may not have always been viewed in such an unfavourable light. In medieval Europe, historical records suggest that violence was a fairly normative behaviour that permeated all aspects of life (Meyerson *et al.,* 2004). Small skirmishes, single battles, and full-scale wars were common in the Middle Ages, and affected high and low status individuals alike. Practicing for combat and learning how to wield weapons were important parts of a boy's[1] upbringing, skills that he was taught from an early age (Waller, 2000b). And armoured knights kept law and order, while bandits and other highwaymen preyed upon wary travellers (Hanawalt, 1979; Kaeuper, 2001). In all, violence appears pervasive, and this acceptance of conflict and aggression as a constant in life may have led to violence being more accepted in medieval society. In fact, it may be argued that it was seen as essential for surviving and advancing in life (Meyerson *et al.,* 2004: 5-6). But, normative behaviour does not necessarily equate to zeal or enthusiasm, and medievalists disagree on how these two similar, but inherently separate, characteristics – violence and barbarism – relate to the medieval populace.

Some earlier scholars who may have been painting history with a more modern brush, assert that the level of violence seen in medieval society was grotesque and that medieval people could not, and would not, control their blood lust (Elias, 1978-82: 72; Gurr, 1981; Huizinga, 1924: 9-10, 28-29; Smith, 1966: 59).

[1] Although usually only boys from high status families.

As Gurr (1981: 307) states: “Interpersonal violence was a recurring fact of rural and urban life. Had medieval Englishmen been equipped with firearms rather than knives and rustic tools, one can only assume that they would have killed one another with even greater frequency”. These past academics viewed medieval Europe as a lawless place, full of unchecked violence, and it is these studies that contributed to the modern stereotypes of medieval brutality highlighted above (Tracy, 2012: 12). In this line of thinking, medieval people were violent solely due to an inherent wildness and cruelty in their predisposition. In short, they fully embodied Hobbes’s idea of human nature when not under the thumb of strict governance.

The majority of modern medievalists have largely panned this position, instead advocating for a culturally relative approach (Meyerson *et al.*, 2004: 3-6; Kaeuper, 2000: 33), positing that violence may have been more prevalent in medieval society than it is today, but it does not mean that it was uncontrolled or lacking in reason. In fact, Meyerson *et al.* (2004: 5-6) argue that it was the means through which people asserted their position in society:

> In medieval society…violence was integral to the processes through which social status was contested and affirmed and economic resources allocated within communities, essential to the creation and maintenance of social order. For medieval people violence was, in other words, normative social practice, a form of social discourse utilized not just by kings, knights, inquisitors, and mobs to oppress and abuse others, but by artisans and peasants, men and women of whatever religion to lay claim to honour and integrity, and to establish and defend a place for themselves and their families in local society.

Meyerson *et al.* (2004) also argue that violence in the medieval period was not due to some instinctual barbarism that was supplanted by our civil, progressive

present, but instead was a vital aspect of state formation, and directly contributed to our current nation-based world. In this view, violence cannot simply be reduced to primitive Hobbesian instincts, but instead suggests that the behaviour is more nuanced with many factors at play, such as economic and political instability or unbalanced social hierarchies and undeveloped legal practices.

Supporting the argument of later medievalists is the fact that not all violence was condoned in medieval Europe, and especially in medieval England, which was arguably well ahead of the Continent in terms of modern ethics (Tracy, 2012: 134). While violence may have been more accepted than it is today, there were still strict laws against certain behaviours (such as homicide, rape, and burglary) and people who committed these acts were tried and punished accordingly (Hanawalt, 1979). The Middle Ages in England saw the formation of the modern criminal justice system with the institutionalisation of formal inquests and trials (Baker, 2007: 12-14, 72-76). Although the wager of battle (trial by combat) was sometimes practiced in the 11th and 12th centuries, by the 13th century (at least in England) the practice was largely supplanted by trial by jury (ibid: 507). Also, unlike on Continental Europe, torture was thoroughly condemned in medieval England (ibid: 508). Medieval England was obviously not completely peaceable, but overall, the medieval period was a much more ordered and litigious society than envisioned by early academics.

Whether advocating for a structured or a chaotic view of medieval violence, very few academics would argue that it was an exceptionally peaceful time in human

history. But, if the more modern interpretation is to be believed, violence was an integral, yet controlled aspect of medieval life that was used as a tool for power and sovereignty (Kaeuper, 2000; Meyerson *et al.*, 2004). In short, the medieval populace used violence to their advantage in order to bring about change and order. Because violence was such a pervasive and influential aspect of medieval life, it is important to fully appreciate how it manifested itself within society: who was affected, how were they affected, and why? In other words, how was violence used to assert oneself in medieval society and who were the victims?

Yet, despite this being an interesting area of research, most of the past assessments on medieval violence, while based on a large wealth of evidence, stems from historical data, which are prone to various biases. Regarding homicide and other violent crimes, court and coroners' rolls provide the most direct evidence. However, these documents are often missing or incomplete, supplying information for only certain years, and only provide evidence of violent incidences that were prosecuted. More indirect evidence, such as depictions of violence found in medieval literature and personal accounts, may merely reflect the author's dramatic licence, instead of actual patterns of violence.

Bioarchaeological data offers another form of evidence that can add to our current knowledge of violence in the Middle Ages. As Walker (2001: 573) notes: "Traumatic injuries in ancient human skeletal remains are a direct source of evidence for testing theories of warfare and violence that are not subject to the interpretative difficulties posed by literary creations such as historical records

and ethnographic reports". In other words, skeletal injuries provide us with tangible evidence of violence in our past that is not contingent on observer bias. This quote does, however, miss the fact that osteological analysis can have as many limitations as the historical record (see Chapter 2), the fact that it only provides evidence of injuries affecting the bone being the most notable. That is why analysing the skeletal evidence in conjunction with the historical evidence is a better approach for understanding medieval violence. For one, it can allow for a deeper analysis of the patterns and prevalence of violence by each discipline helping to fill in the gaps in knowledge left by the other. Additionally, concordance between the two can help strengthen the veracity of certain findings. It is this integrative methodology that is employed in this research, which explores the structure of violence in medieval London.

1.1 AIM AND OBJECTIVES

The main aim of this research is to identify and interpret the patterns and prevalence of trauma, particularly that which may be attributed to violence, from medieval London skeletal assemblages. In general, violence is the main focus of this thesis, but other types of trauma are also identified and briefly examined in order to provide context for the interpretation of violence-related injuries. In total, data from six distinct sites in and around the City of London, comprising over 750 skeletons, were personally analysed by the author for signs of violence (Table 1.1). These sites include the three parish cemeteries of St Nicholas Shambles (GPO75), St Lawrence Jewry (GYE92), and St Benet Sherehog (ONE94),

as well as the three monastic sites of London Blackfriars (PIC87), St Mary Spital[2] (NRT85), and St Mary Graces (MIN86). Additionally, the raw data from 5,400 skeletons interred in the main cemetery of the medieval hospital and monastery of St Mary Spital (SRP98)[3] were also included in the overall data, to help create a more complete picture of violence in medieval London. Overall, these seven collections represent almost all the remains currently excavated from medieval London. And while the total sample only represents a small percentage of medieval Londoners, the different sites do represent a relatively wide range of the medieval London population, including individuals with various occupations and from different social backgrounds as well as individuals from every century of the later medieval period (see Chapter 4 for the demographic composition of each assemblage).

Table 1.1: List of Collections

COLLECTION	TIME PERIOD	CEMETERY TYPE	# OF SKELETONS
St Nicholas Shambles (GPO75)	1000-1200	Lay	218
St Lawrence Jewry (GYE92)	1050-1140	Lay	16
	1140-1230		41
	1270-1350		1
	1550-1666		2
Spital Square (NRT85)	1200-1500	Monastic	48
St Mary Spital (SRP98)	1120-1200	Monastic	510
	1200-1250		1398
	1250-1400		2842
	1400-1549		650
Blackfriars (PIC87)	1200-1538	Monastic	56
St Mary Graces (MIN86)	1350-1400	Lay	187
	1353-1388	Monastic	2
	1353-1400		10
	1353-1538		77
	1400-1538		83
	1424-1538		2
St Benet Sherehog (ONE94)	1250-1500	Lay	8
	1280-1666		13

[2] The skeletons from the small, earlier cemetery from St Mary Spital were personally analysed by the author. This site is thought to have primarily interred inmates of the hospital.

[3] The skeletons from this site were excavated from the much larger, and later, cemetery from the precinct of St Mary Spital. Unlike the NRT85 site, the SRP98 cemetery includes inmates of the hospital, but also monastic and lay brethren that ran the hospital and the attached monastic house as well as donors and perhaps other members of medieval London society as hypothesized in Chapter 4.

While all of the collections analysed in this research have already been catalogued by Museum of London Archaeology (or its earlier predecessors) and curated by the Museum of London, identifying signs of trauma was not a priority in the initial assessment of these skeletons. As such, many of the injuries identified in this study have not previously been recorded, and in completing this research a more accurate database of trauma for these collections was created. This is the thesis's primary contribution: establishing a more complete record of trauma for the medieval London skeletal assemblages. In addition, it also offers the first comprehensive analysis of violence in medieval London by using evidence from multiple skeletal assemblages as well as by using an integrative biocultural approach, that bring in multiple lines of evidence, to analyse the results. To achieve this, contextual evidence, both archaeological and historical, and theoretical evidence are combined with the osteological data in order to create a fuller picture of how violence manifested itself in medieval London society (see Chapter 2 for more details on methodology). In particular, the principal focus is on identifying differences between the sexes, between those from different burial locations (specifically monastic versus parish lay cemeteries), as well as over time in an attempt to provide a deeper understanding of how the patterns and prevalence of violence may have varied. The reasoning behind this focus is discussed further below.

A more in-depth discussion of past research in this area and how this study fits into it can be found in Chapter 2. But, to quickly summarise, in general, trauma patterns and prevalence from the medieval period are understudied areas in osteology with much of the previous work on violence having focused on

prehistory. Of the studies that have been done on medieval violence much of the past research has concentrated on collective violence. In particular, many of the larger studies have examined mass graves from battle sites (see Cooper, 2010; Cunha and Silva, 1997; Inglemark, 1939; Kjellström, 2015; Novak, 2000) while other, smaller case studies have looked at either individuals or small groups of individuals presenting with perimortem weapons-related trauma attributed to warfare (see Appleby *et al.*, 2015; Brødholt and Holck, 2012; Geber, 2015; Giuffra *et al.*, 2015). While these studies have greatly contributed to our knowledge of medieval warfare, it was the not the only type of violence that occurred in the Middle Ages and it is important that interpersonal violence patterns are fleshed out in more detail. If violence was such an integral aspect of medieval society as previous studies have argued (see above), it is important to be able to fully appreciate how it manifested itself both on the battlefield as well as in the community.

Regarding research into interpersonal medieval violence, some site reports from attritional cemeteries cite minimum observed numbers of trauma (see Dawes and Magilton, 1980; Lilley, 1994; Mays *et al.*, 2007; Stroud and Kemp, 1993), but in many instances, perhaps because these reports do not often focus on trauma identification, some traumatic lesions are not recorded[4] and hence these reports are often incomplete. They often also do not take the further step of analysing the cause of such injuries. Comprehensive analyses that attempt to look at larger patterns of violence in the Middle Ages, including interpersonal violence, and

[4] This is supported by the fact that this study found many instances in which many traumas were not reported in the individual site reports. This with be discussed further in later chapters.

compare different skeletal assemblages are rare. Kjellström (2014) has analysed and compared the two medieval Swedish towns of Sigtuna and Västerhus and Šlaus *et al.* (2012) have analysed varying patterns of violence in Croatia from antiquity to the late medieval period, comparing multiple attritional cemeteries from multiple time periods. In terms of research involving medieval England, Knüsel (2014) has combined evidence from several studies, including ones mentioned above (specifically the Battle of Town, the Battle of Wisby, the Battle of Good Friday, and the St Andrew Fishergate lay cemetery), but once again, while a comprehensive and comparative study, it focuses on evidence of warfare, not community-based violence. A study focusing on medieval London has never before been carried out.

To rectify this dearth of research on London, this study aims to follow in the footsteps of the comparative studies highlighted above, analysing osteological, archaeological, and historical evidence to examine the characteristics of violence in medieval London, be it collective or interpersonal. Similar to the studies done by Kjellström, (2014) and Šlaus *et al.* (2012), the research in this thesis attempts to address possible instances of interpersonal violence in medieval London as well as possible instances of collective violence. It further advocates for an increase in research in this area and hopes to set precedence for future studies to investigate data from multiple skeletal assemblages in an endeavor to discern larger patterns of medieval violence in other areas of the medieval world. Only through more studies can we begin to fully grasp the role violence played in medieval society. Ideally, similar research would be carried out on every

medieval site that is, or will be, excavated so that as many regions and as many centuries are represented as possible.

As noted above, the osteological results are combined with the historical record in order to provide a more considered and complete analysis. While past historical research is drawn on heavily, pertinent historical documents have also been personally analysed by the author. In particular, the London Coroners' Rolls, which cover fourteen years between 1300 and 1340, were analysed for information concerning weapons used, location of injuries, and location of attack as well as the sex and social status of both victim and perpetrator. The two surviving eyre rolls from the late 13th century have been extensively analysed by Given (1977) and are also included in the analysis of the historical record from medieval London in Chapter 3. While the time frame these rolls cover is rather limited, and is unable to provide information from much of the period in which the individuals from the skeletal collections lived, further documents from medieval London have unfortunately not survived. These rolls are, therefore, one of the only means available for us to examine violence in medieval London using the historical record. The results from the analysis can be found in the appendix.

Medieval London is the sole focus of this study for several reasons. For one, it has one of the largest pools of excavated remains from which to draw, whereas the number of human remains from other medieval urban centres is few[5]. A large, comprehensive dataset that represents as much of the medieval population as possible is imperative in order to accurately interpret larger patterns of

[5] Medieval York being the possible exception.

medieval violence, which is a main goal of this research. Secondly, between the 11th and 15th centuries London became the epicentre of the English economy, with flocks of migrants flooding its gates looking for prosperity. This diversity means that a large subset of the medieval population is represented by this study, allowing for interesting interpretations. Conversely, since medieval London's diverse population did not exist anywhere else in England, care must be taken when extrapolating these findings to other, more homogenous, medieval populations such as those found in smaller, more remote towns and villages like the Yorkshire wold village of Wharram Percy for example (Mays *et al.*, 2007). As London was a unique medieval city, it is likely that the patterns and prevalence of violence occurring within its walls was unique as well.

1.1.1 DEFINITIONS OF VIOLENCE

Past studies have used a plethora of terms to describe violence, with popular expressions including *conflict* and *aggression*. But, recent consensus has agreed that violence is the best term as it implies "intentionality, motivation, and culturally defined meaning" (Martin and Harrod, 2015: 116). However, violence itself is an imprecise term that can be used to describe quite disparate behaviours. From a schoolyard fight to the organised torture of a country's own citizens, in studying violence it must first be determined what that term includes. The definition used in this study is the one given by the World Health Organisation, as it has been used in previous osteological studies on medieval violence (Connell *et al.*, 2012: 181). It defines violence as:

> The intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or

> community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment or deprivation (Krug *et al.*, 2002: 5).

Apart from its common usage, this definition was also chosen because the comprehensive phrasing addresses the fact that violence is an umbrella term for many different types of behaviour. In particular, the wording allows for the incorporation of interpersonal violence (i.e. personal conflicts between individuals) as well as collective violence (i.e. large-scale conflicts between groups, communities, or states for economic, social, or political advancement), two aspects of violence that are analysed in detail in this thesis. The inclusion of psychological effects acknowledges the actuality that not all violence is physical in nature. This is an important aspect of violence that needs to be recognised in this study, but, unfortunately, cannot be elucidated since psychological impacts remain hidden from the skeletal record.

The above discussion on violence is a modern interpretation of what connotes violence and it must be noted, that since perceptions of violence are shaped by culture, many of the behaviours that would be considered violent in today's society were not so in the past (Martin and Harrod, 2015: 116). However, using a historically relevant definition of violence may be problematic. For instance, in many modern western civilisations, any corporal punishment against one's spouse or children is condemned as domestic violence, and the perpetrator is likely to be prosecuted. Conversely, in the medieval period (as well as in some cultures today) such behaviour was not illegal, and often encouraged. In the case of medieval Europe, the Church promoted the use of corporal punishment against one's wife and/or children in order to assert one's authority and keep

them “well-behaved” (Helmholz, 1993: 24; Butler, 2001: 68). Thus, excluding domestic abuse from the definition of violence may be historically accurate, but it does not help us gain a better understanding of how medieval people were injured. Additionally, while the actions may have been condoned, it can be argued that the wives and children were likely to have been adversely affected by corporal punishment, either physically or emotionally, whether it was legal or not. The position held in this thesis is that just because certain behaviours are normalised, does not mean that they do not constitute violence and they should be included in the overall analysis.

1.1.2 DEFINITIONS OF BIOARCHAEOLOGY AND OSTEOLOGY

Apart from identifying the concept of violence, it is also imperative to define bioarchaeology. It is a complex field that encompasses many different sub-disciplines and often, various terminologies are used in different parts of the world. For instance, in North America, where archaeology is a sub-discipline of anthropology, the terms *biological anthropology* or *physical anthropology* is the preferred terminology for the biological study of human and primate behaviours as well as hominid evolution (Roberts, 2009: 3). In the United Kingdom, and throughout much of Europe, where archaeology has a more robust history as a discipline, *bioarchaeology* is the term most commonly used, and is the preferred terminology used in this thesis.

Whichever term you use, the study of bioarchaeology includes many different lines of evidence, which primarily revolve around the macroscopic, microscopic,

and chemical analysis of bones. Chemical analysis can include radiocarbon dating (to determine the age of the specimens), stable isotope analysis (to determine diet and migration patterns), and ancient DNA analysis (to determine ancestry, sex, population movement, etc.). Osteology, the general study of bones, or osteoarchaeology, the study of archaeological bones, are also terms commonly applied to the discipline and are used in this thesis to denote the physical examination of skeletal remains.

Palaeopathology is both its own discipline as well as a sub-discipline of bioarchaeology. Simply it is the study of ancient diseases, but it is often expanded to include trauma and other physical genetic deformities. It is inherently interdisciplinary, and apart from an osteological approach, it can also include the study of disease through historical records. This term is only used sparingly in this thesis, but when it is used, it references the sub-discipline of bioarchaeology and specifically refers to the analysis of trauma unless otherwise indicated.

1.1.3 HISTORICAL AND BIOARCHAEOLOGICAL FRAMEWORK

As noted above, this research provides an integrative approach in which the osteological data is combined with historical contextual evidence in order to form a more comprehensive analysis of violence in medieval London. This approach has had an erratic history. In the past, historical archaeology has been criticised as "an expensive way of telling what we already know" (Deagan, 1988). It is true that historical archaeology is distinctly different from prehistoric archaeology in that it is not the only evidence we have to draw upon, and in

many ways the historical record has been viewed as the primary source of knowledge, with archaeology merely providing secondary evidence (Andrén, 1998: 3; Tarlow, 2007: 195-196). While most arguments have been applied to the post-medieval and modern periods, since there is more textual evidence from these periods, a similar argument can be made for the medieval period. What can the material culture and, in the case of this research, the osteological evidence tell us about the Middle Ages that the historical record cannot? Primarily, historical archaeology can help fill in the gaps left by the historical record, but the evidence it provides can also in many ways complement and enrich the historical narrative.

Both the historical and the archaeological records are subject to biases, demonstrating how neither necessarily trumps the other in terms of accuracy and quality of information. Written records are often incomplete, subject to the biases of the author, and often exclude the poorer members of society since, historically, they were often illiterate. They do, however, provide us with information on personal thoughts and opinions, notable events and other immaterial aspects of society that cannot be captured by the archaeological record. Additionally, archaeology cannot provide us with information on intentionality. It can, however, provide us with the "non-intentional material by-products of life", aspects of society that are not expressly written down or documented (Deagan, 1988). In terms of violence, while state-based violence, such as wars, are often heavily documented, personal, more unstructured forms may remain unrecorded. Bioarchaeology offers us a way of uncovering these hidden behaviours as well as adding evidence to the more visible aspects of

chronicled history. It is, however, biased towards injuries that affect the bone, meaning that soft tissue injuries remain hidden from the archaeological record[6]. Ultimately, both disciplines have their weaknesses, but combined together they can offer us a fuller picture of the past.

Indeed, using both historical and osteological evidence has been quite successful in past research on the medieval period. The site report for the mass grave from the Battle of Towton (Fiorato *et al.*, 2000), while predominately focused on the osteological evidence, also provides insight from historians on medieval battle tactics and weapons used (see Richardson, 2000; Rimer, 2000; Waller, 2000a; Waller, 2000b), comparing it with the weapons-related trauma observed by Novak (2000). Šlaus *et al.* (2012) used a smattering of historical evidence to support their results, although it could be argued that even more use of historical evidence is warranted, as their hypothesised causes for increased medieval violence are a bit thin and unsupported in places. Kjellström (2014) uses historical records that seem to indicate that violence against women in medieval Sweden was a normalised behaviour to contrast her findings of minimal injuries amongst females from two medieval Swedish sites. Similarly, Mitchell (2006) contrasts the historical record from medieval Caesarea, which indicates that the area saw much conflict, with the osteological evidence, which revealed few indications of widespread violence. Ultimately, by comparing and contrasting historical and archaeological evidence, we cannot only construct a more complete picture of the past, we can also discover ways in which each form of evidence is incomplete.

[6] Chapter 2 delves further into the limitations of bioarchaeological research.

1.3 HYPOTHESES AND RESEARCH QUESTIONS

The interpretation of the results is focused on several factors that might help characterise as well as explain the patterns and prevalence of violence in medieval London. Modern studies of violence focus on theoretical frameworks that help us contextualise how the behaviour is structured in a particular culture. The general application of social theories in bioarchaeological studies is explored further in Chapter 2, but for this research specific cultural factors that have been shown to influence the structure of violence are examined. They include: social status, sex, and time period.

As this study analyses the individuals from the medieval London collections as a whole, no one framework is used since the types of violence that are likely to be represented in the skeletal evidence are too broad to fit under one succinct theory. Instead, previous empirical studies, based on both historical and modern data, which have elucidated theories on violence, are used to help hypothesise what trends we may see in the results of this thesis. While these theories will be further developed in the discussion chapter when they are applied to the results of this study, this section aims to brief the reader on what trends we may expect to see based on relevant past research. Over the course of this thesis, these theories and patterns will be augmented with more information as it becomes relevant.

In terms of social status, theories on violence, particularly regarding homicide and domestic violence, suggest that it is primarily a behaviour characteristic of the poorer classes (Browne *et al.*, 1999; Buka *et al.*, 2001; Wolfgang, 1958). Clinical research supports this notion. Hospital admittance shows that impoverished males, particularly those who are unemployed and involved in substance abuse, are disproportionately the perpetrators and victims of violence (Goins *et al.*, 1992; Sims *et al.*, 1989). But, this pattern may not have been true historically. Some authors have argued that in the past violence could be found amongst all echelons of society, not just those of lower status (Cooney, 1997; Kiernan, 1988). Cooney (1997) in particular makes the case that, historically, those of higher status often committed violence in the name of personal or family feuds, either through duelling, battle, or more unstructured brawling. He further clarifies this argument by saying that the decline in lethal violence amongst those of higher social status in modern populations is likely due to the increased availability of resolving conflict through legal means. He uses Black's (1983) argument, that violent crime is a method of conflict management and a way of addressing grievances, to support his theory. Although Cooney's (1997) study lays out a strong case for the decline in violence amongst those of high status, he does not discuss if or how violence amongst those of lower status has changed. He does, however, argue that while the law protects lower status individuals, they are sometimes excluded from legal recourse by high legal fees and a general distrust of law enforcement. The same is likely to have been true in medieval England (Baker, 2007: 120).

While historically the presence of violence may have affected those of all social status, there seems to be a larger divide based on sex. As noted by Gurr (1981: 307): "…early estimates of homicide rates [in medieval England] and their contemporary descriptions all sketch a portrait of a society in which men (*and not women*[7]) were easily provoked to violent anger and were unrestrained in the brutality with which they attacked their opponents". Although Gurr's depiction may be a bit extreme (and more in line with earlier academics concerning their views on barbaric medieval violence), males partaking in more violent behaviour than females appears to be a consistent pattern of violence, found in all cultures and throughout history (Gottfredson and Hirschi, 1990: 45). It should be noted, however, that Gurr's assessment focused on the perpetrators of violence, so we do not know how this theory would translate to the interpretation of traumatic lesions on the victims. However, it is known that in modern populations males appear to be the victims of violence as much as they are the perpetrators of violence, with male-male violent crime being the most common (Goins *et al.*, 1992; Sims *et al.*, 1989). Thus, we may hypothesise that if males are the most common perpetrators of violence in medieval England they may also have been the most common victims as well.

In terms of females affected by violence, domestic violence appears to be one of the most, if not the most, common cause of assault against women today (World Health Organization, 2012). In particular, Levinson (1989) has found that domestic violence, particularly husband's beating wives, is more prevalent in societies in which this behaviour is either condoned or encouraged. In medieval

[7] Emphasis added.

Europe, it is known that the Church actively encouraged the use of corporal punishment against one's wife or children in order to "keep them in line" (Helmholz, 1993: 24; Butler, 2001: 68). So, if Levinson's theory holds true, it might be expected that women would have been more likely to face abuse from their husbands in the medieval period than they would in today's western society where domestic violence is actively discouraged.

Concerning the changing prevalence of violence over time, it has been convincingly argued that all types of violence have largely decreased throughout the course of human history (Eisner, 2003; Gurr, 1981; Pinker, 2011). A particularly clear decrease has been shown in Europe between the thirteenth century and today (Gurr, 1981; Figure 1.1). Additionally, the modern legal system is known to have begun during the medieval period, and strengthened over the course of it. And, as noted above, Cooney (1997) asserted that violence, particularly high-status violence, decreases in the presence of a more structured legal system. Thus, the combined evidence suggests that we might expect to see a decline in violence between the 11th and 16th century, as the implementation of the law became more consistent.

However, the theory of decreasing violence over time only looks at violence on a macro scale. It does not take into consideration potential smaller scale fluctuations in violence and violent crime. In order is assess how violence in medieval London may have varied between the centuries, we need to appreciate what factors influence the presence of violence. We have already assessed how violence is potentially more common among males, particularly those of lower

status (although with obvious caveats), but the level of violence even amongst these individuals is unlikely to remain constant over time and through space.

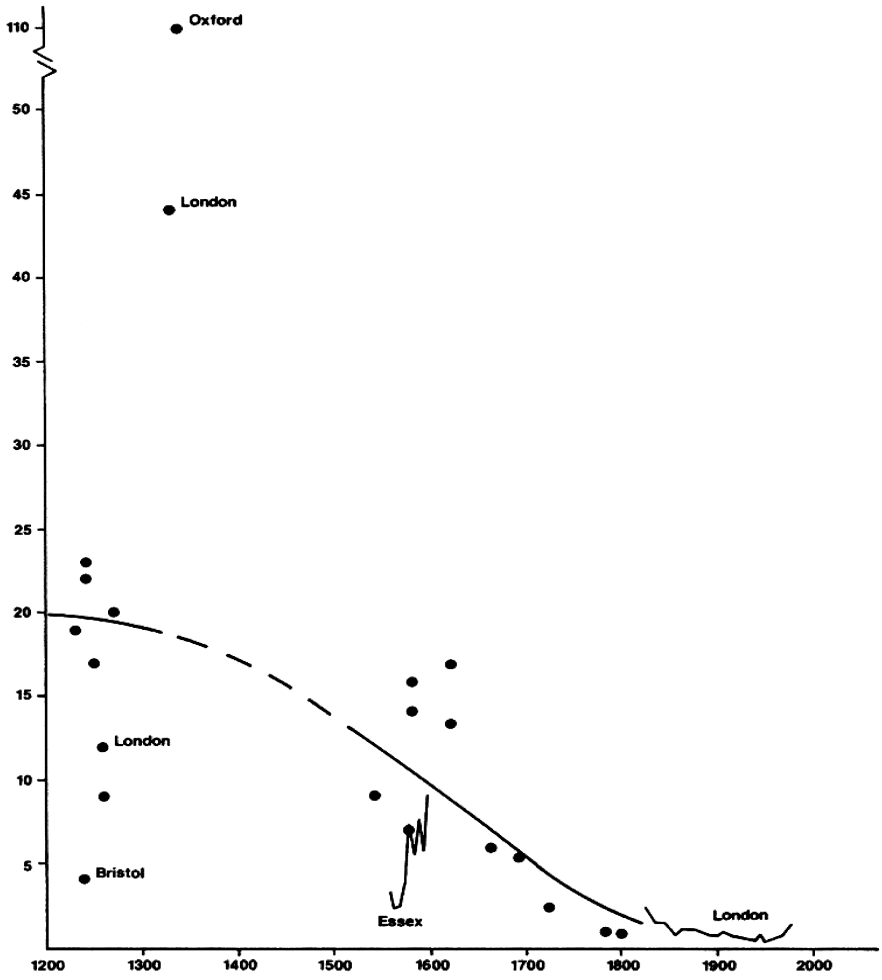


Figure 1.1: Prevalence of Homicide per 100,000 people in England between the 13th and 20th centuries. © Gurr (1981: 313).

One convincing theory on fluctuations in violence is that periods of "stress", whether political, economic, or social, are likely to lead to an increase in the overall prevalence of violence (Fox *et al.*, 2002; Sampson and Groves, 1989). These "stressors" might include things like times of war, revolt, or rebellion, periods of famine or drought, and crises such as widespread epidemics. In other words, factors that cause either political/social restructuring or intense

competition over resources can also lead to an increase in all types of violence, including domestic violence (Colson, 1995; Raghavan *et al.*, 2006). Applying this theory to medieval London, we might expect increases in violence during specific periods of instability. While warfare defined much of the medieval period, famine and plagues occurred during very specific periods. In particular, the Black Death in the mid-14th century led to a complete restructuring of the medieval social hierarchy system, including the end of the feudal system (Herlihy, 1997: 36-37), so we might expect a period of increased violence during this time.

1.4 STRUCTURE

The structure of this thesis is focused around an integrative approach to interpreting violence-related injuries observed on skeletal remains. It seeks to thoroughly outline the socio-historical information of medieval London and combine it with the archaeological, and more specifically the osteological evidence. It then frames the analysis in terms of social theories on violence that have been previously elucidated above. Chapter 2 outlines this approach in more depth and explains how it has been used successfully in past studies to analyse both collective and interpersonal violence during the medieval period. It also argues how this study fits within this previous research.

There are two background chapters that provide much of the context for the biocultural interpretation of violence. These chapters form a comprehensive part of this thesis, as they are as integral to the discussion of the osteological results.

The first background chapter, Chapter 3, examines the historical evidence for violence in medieval London specifically, and in England more generally. This review provides background for what is currently known about the patterns and prevalence of medieval violence, allowing for a comparison with the skeletal evidence. It is broken down into three main types of violence: interpersonal, communal, and self-directed. The review of interpersonal violence primarily revolves around the historical data provided by the London Coroner's Rolls, although other sources are incorporated when available. It focuses on what evidence exists for different homicide patterns in terms of how men, women, and children were affected as well as which neighbourhoods were afflicted the most, highlighting their socio-economic status. The section on communal violence gives pertinent examples of social and economic violence in and around medieval London. It also provides information on political violence, particularly warfare. A small section on self-directed violence summarises the small amount of information available on medieval suicide.

The fourth chapter provides the historical context for the skeletal collections analysed in the course of this research. In order to more correctly interpret possible signs of violence on a skeleton, it is imperative to understand as much as possible about the life histories of these individuals: who they were and where they came from (Martin and Harrod, 2015: 119). This chapter does so by highlighting the characteristics, such as socio-economic status and occupation, of the people most likely to have been interred within each cemetery. It also addresses what risks these individuals may have been party to during their lives and how it might have affected their susceptibly to injury.

The fifth chapter provides background information on the archaeological context for each skeletal collection, information that is imperative to the interpretation of violence. More complete site information can be found in the appendix. It also outlines the methodology used during the course of data collection for this research, including the criteria used to assess skeletal evidence for trauma generally and violence more specifically.

The sixth chapter presents the results of the individual skeletal collections, focusing on the demography of each skeletal collection as well as the prevalence of trauma, and in particular, violence-related injuries. The seventh chapter combines the results from each skeletal collection in an attempt to form a larger picture of violence in medieval London. It also compares them with each other in order to ascertain any dissimilarity in violence-related injuries between the sexes, between individuals from different burial locations, or over time.

Chapter 8 discusses the significance of these results and interprets possible meanings for the structure of violence in medieval London. As noted above, the historical and cultural information provided in the second and third chapters is integrated with the results from the fifth and six. Changes in prevalence as evidenced by differences in sex, age, burial location, and over time are discussed in the first section. The second section focuses on patterns of violence, postulating weapons that may have been common to the period and possible causes for these injuries. The final conclusions of this thesis, and its potential impact on past and future studies of medieval violence are outlined in Chapter 9.

CHAPTER 2: BIOARCHAEOLOGY AND VIOLENCE

Some previous studies have identified violence as an aberrant behaviour that is either solely due to our instinctive, barbaric nature or to culturally-based nurturing (see Ahlström and Molnar, 2012: 32-33; Chagnon, 2013; Wade, 2014). But, this study, and other, more anthropological studies (see Martin and Harrod, 2015), believe that the two are not mutually exclusive, and that reinforcing this dichotomy of nature versus nurture misses how each influence the other. Violence is, inarguably, a highly evolutionarily conserved behaviour, as evidenced by the fact that it can be found in virtually all cultures throughout time and space (Shackelford and Weekes-Shackelford, 2012). But, attributing violence solely to our genetic makeup is imprudent (Gillett and Tamatea, 2011). As with most human behaviours, violence affects and is affected by other aspects of culture, meaning that different societal factors can influence its presence and construction (Fry, 2013; Fuentes, 2013: 79). For instance, domestic violence exists in some form in every culture, but the prevalence of domestic violence in societies that accept and/or encourage domestic violence is much higher than those societies that do not (Levinson, 1989).

Because of this reality of culturally-influenced violent behaviour, when analysing the patterns and prevalence of violence in the past, it is imperative to take other societal factors into account. Therefore, a multifaceted approach that attempts to more fully reconstruct the makeup of a past culture is best (Martin and Harrod, 2015). Modern approaches to bioarchaeological research address this necessity and have incorporated it into their methodology. This biocultural approach, and

how it is applied to this research, is outlined below, focusing on the integration of three key areas of analysis: skeletal evidence, contextual evidence, and theoretical evidence. Yet, despite this more comprehensive methodology, there are still limitations to this form of research and these are also elucidated below, reflecting, in particular, on how these problems affect the overall interpretation of the results.

While the biocultural approach to violence is relatively new, the study of violence in bioarchaeology is not. There is a long-standing history of identifying signs of violence from skeletal remains and many accounts relating to the bioarchaeology of violence and warfare have already been synthesised in depth by many specialists in the field (see Carman, 1997; Knüsel and Smith, 2014; Martin *et al.*, 2012a; Martin and Harrod, 2015; Walker, 2001). However, in terms of medieval violence, the research is much scarcer. An assessment of the previous bioarchaeological literature on the medieval era is reviewed in the second section of this chapter in order to elucidate common themes that have already been highlighted regarding medieval violence as well as to provide context for the basis of this research.

2.1 BIOARCHAEOLOGICAL APPROACH TO VIOLENCE

As highlighted above, analysing violence in the osteological record requires a complex, multifaceted approach. Martin and Harrod (2015: 119) concisely synthesised the most comprehensive way in which bioarchaeologists approach the study of violence (Figure 2.1):

> Biological anthropologists analysing human skeletal remains to understand violence in its fullest and richest formulations rely on the biocultural approach and the integration of three research strategies that link data at three different levels. These include: (1) the analysis of evidential data from the skeletal remains, (2) the analysis of contextual data from reconstructions of mortuary features, material culture, environment, subsistence, political and economic structures and other aspects of the culture from which the remains are from, and (3) the use of social theory based on ethnographic work that provides an effective way of formulating and evaluating hypotheses.

Martin and Harrod (2015) focus on violence in antiquity, but the same methods can also be applied to more historical remains as well. Overall, this is a fairly comprehensive approach that allows for the incorporation of other forms of evidence, necessary for the thorough analysis of the presence of violence in society. Specifically, it takes into consideration other cultural factors that may affect the patterns and prevalence of violence in a society. Many earlier bioarchaeological studies on violence have been largely descriptive and in so doing have largely failed to grasp the larger implications of violence on culture and human behaviour (Martin *et al.* 2012b: 1). These more descriptive studies were needed to help establish the fundamentals of studying violence bioarchaeologically, but now as the discipline has progressed, more considered and integrative analyses are required. Without taking this next step we cannot hypothesise as to the impact such violence had on the society under consideration. It is for these reasons that the approach highlighted by Martin and Harrod (2015) is used in this study. The specifics of this approach and how it is applied to this study are further outlined below. Overall, while individually these different lines of evidence (skeletal, contextual, and theoretical) may be limited in their ability to inform, combined they can begin to reconstruct the picture of past individuals and their life experiences.

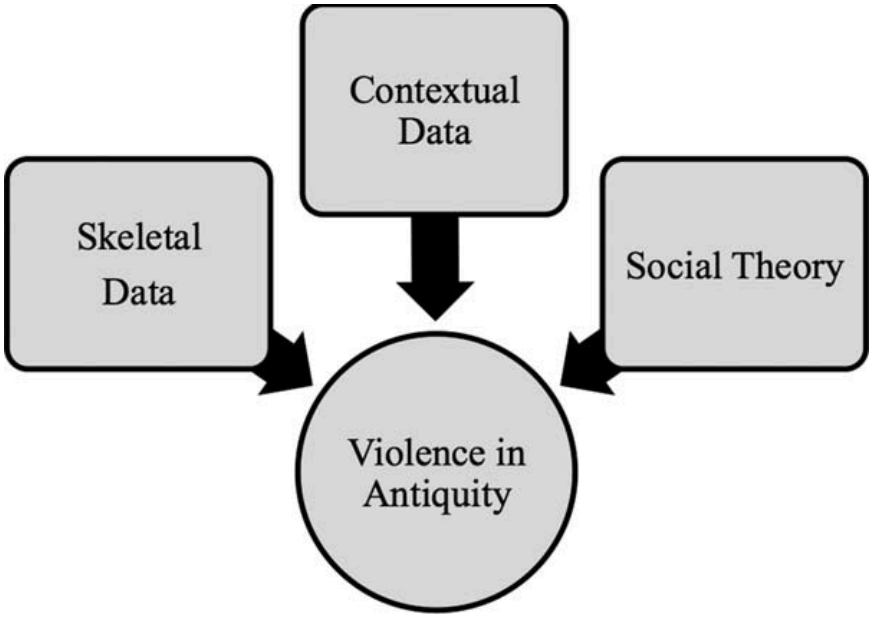


Figure 2.1: Integrative method used to analyse violence archaeologically. Martin and Harrod (2015: 120).

2.1.1 SKELETAL EVIDENCE

As emphasised by Martin and Harrod (2015), the bones themselves provide the first line of evidence, and it is the incorporation of skeletal data that defines bioarchaeological research in the first place. It primarily incorporates the macroscopic analysis of human remains in order to determine demographic information (e.g. age and sex), palaeopathological information (e.g. disease or trauma lesions), and activity/lifestyle changes (e.g. handedness and occupational effects). As defined in Chapter 1, bioarchaeological research can also include microscopic and chemical analysis, such as isotope or DNA analysis, of the remains, which can help provide further evidence as to the life course of these individuals. This study focuses on the identification of traumatic lesions, particularly those likely caused by violence, and integrates it with the assessed demographic information. The full skeletal methodology used in this study can

be found in Chapter 5, but a basic outline of common themes in the osteological approach to studying violence are highlighted below.

There are two primary objectives in analysing trauma in human remains, after identifying and recording the presence of trauma. The first is to ascertain the timing of the injury: did it happen before (antemortem), during (perimortem), or after death (postmortem; see Walker, 2001: 576-577). This allows bioarchaeologists to hypothesise as to whether the injury is likely to have contributed to death or not[8]. And the second is to determine the probable cause of the injury. Focus is particularly drawn to distinguishing between accidental and intentional injury, something that is quite pertinent to the research carried out in this thesis. Some studies use the terminology *violence-related trauma* or *violence-related injuries* to denote bone lesions that are potentially caused by violence (Brickley and Smith, 2006; Martin and Harrod, 2015; Walker, 2001). While the more specific methodologies are described in Chapter 5, to give a brief overview of where the discipline stands on such identification, past studies have concentrating on identifying the "causative instrument and/or injury mechanism" (Judd and Redfern, 2012: 365; Jurmain, 2005: 186-188) in order to hypothesise the cause of injury. This approach not only allows us to analyse how people were injured, it also can tell us what weapons may have been used.

Other themes in analysing skeletal data include looking at the pattern of injury, which involves recording the number of injuries and where they are located.

[8] Being able to determine cause of death can be quite difficult, if not impossible, in skeletonized remains.

This can help provide further evidence as to the structure of violent behaviour (see Walker, 2001). In particular in can help us determine intra- versus intergroup violence. For instance, patterns of weapons-injuries in skeletons from attritional cemeteries as well as mass graves from battle sites have been used as evidence of warfare and other small-scale conflicts between different groups (Brødholt and Holck, 2012; Cooper, 2010; Inglemark, 1939; Novak, 2000; Paine *et al.*, 2007; Smith, 2014). Similarly, high levels of cranial depression fractures, maxillofacial fractures, and parry fractures, have been used as examples of intragroup, or interpersonal, violence (Elliot-Smith and Wood-Jones, 1910; Kjellström, 2014; Novak, 2006; Redfern, 2015; Webb, 1995). Some osteological studies have gone one step further, demonstrating how different cultures can and will have different patterns of injury depending on how violence is structured in that society (Brickley and Smith, 2006; De La Cova, 2010; Geber, 2015).

Patterning and number of injuries can also help us look at injury risk and susceptibility. Individuals who are particularly prone to injury due to their lifestyle are known as injury recidivists. In modern instances, injury recidivists are usually younger males of low socioeconomic status who are un- or underemployed and are frequently involved in illegal behaviour such as crime and/or substance abuse (Judd, 2002). To examine the presence of injury recidivists in the past, Judd (2002) examined the demographic pattern of those with multiple injuries, ascertained if there was a difference in the injury pattern between different demographic groups, and then assessed the association between nonlethal violence and accident-related injuries. She found that, similar

to modern trends, during the Kerma Period of ancient Nubia most of the individuals presenting with multiple injuries, particularly violence-related ones, were young males (ibid). Her study showed not only that injury recidivists likely existed in the past, but also adds credence to the idea that violent behaviour has stayed much the same between then and now. The presence of injury recidivists in this research is analysed in Chapter 7.

Traumatic lesions are not the only important changes to bone that should be identified and analysed. Pathological changes to the skeleton should also be noted as they can provide important clues to either the cause of the injury or the social-economic status of the individual (Mann and Hunt, 2005). As Martin and Harrod (2015: 121) noted, "[health] is important to consider when looking at socially-sanctioned or structural violence, where individuals are put at higher risk of injury or disease as a result of social inequality". Analysing the association between trauma and other pathological changes allows us to form a deeper understanding of the cause of certain injuries. For instance, if an individual with hip dysplasia presents with several fractures to the long bones, it may be argued that this congenital deformation may increase the individual's susceptibility to injury. As such, all palaeopathological lesions, and not just those associated with trauma, were recorded and analysed for this research.

2.1.2 CONTEXTUAL EVIDENCE

Apart from the bones themselves, contextual data is an important aspect of accurately interpreting violence-related injuries. As Walker (2001: 574-575) states:

> A single piece of evidence such as [an arrow point embedded in a vertebra] concerning past human behaviour has limited evidentiary value. However, when many such examples are assembled and viewed within their larger archaeological and palaeoecological context, it is possible to greatly constrain the range of plausible alternative behavioural explanations.

In other words, by analysing the skeletal data in light of the broader cultural and historical context, we are able to construct more convincing arguments as to the cause and effect of such violent behaviour.

The first line of evidence comes from the mortuary context (Rakita, 2005, for specifics of medieval remains see Gilchrist and Sloane, 2005): How was the individual buried and in what position? For instance, are they buried in an elaborate coffin or were they simply interred directly into the ground? By comparing the style to other contemporary burials, can we reflect on social status or occupation? Additionally, if the burial position is abnormal when compared to traditional burial practices of the time (for example, buried face down in the grave), what does this tell us about the individual (e.g. deviant burials; Reynolds, 2009)? Were they a criminal who did not "deserve" a proper burial? Were they suffering from a contagious disease and simply thrown into the ground with little pomp or circumstance? Are they an infant and the unique burial position is representative of their unbaptised status? Of additional importance is the location of the grave in relation to the burial area. Was the

individual buried close in an important landmark, such as an altar or cross? Are burial locations hierarchical with those of a certain socioeconomic status favouring particular locations?

These are the kinds of questions that should be asked and can provide useful clues for overall analysis. For this study, the excavation team recorded the mortuary context for all analysed assemblages. However, as all of the sites were excavated at different times by different people, the details of the recording differ. In some instances, it is merely recorded that the individuals were buried in a traditionally medieval Christian way (supine in an east-west direction; Gilchrist and Sloane, 2005: 106, 111, 152). In others, each slight deviation from the norm is noted.

In addition to the burial context, aspects of material culture, such as the presence of grave goods, can also help to further establish contextual evidence, including possible social status and/or occupation. In medieval England, bishops and other religious men were often buried with chalices (Connell *et al.*, 2012: 201; Gilchrist and Sloane, 2005: 160). It then follows that any chalice found within excavated medieval graves might indicate that the individual was a bishop or religious man. Unfortunately, bar a few exceptions such as the chalice, graves goods were not as common during the late Middle Ages as they were earlier in the period (Gilchrist and Sloane, 2005). So, for this research they are not as fruitful an area of contextual data as they may be for other time periods.

Less specifically, other known aspects of a particular culture play an important role in being able to construct a convincing argument as to the cause and effect of violence in a society. This can include anything from political and financial structures to medical practices and family hierarchies (see Lessa and Mendonça de Souza, 2004 for a pertinent example). While for prehistoric remains this knowledge may be limited, for historic remains the evidence can be abundant. All possible avenues should be explored when collecting relevant information to aid in the interpretation of skeletal trauma. Martin and Harrod (2015: 122) advocate for a "meticulous reconstruction of the archaeological record" because the more that is known about both the individuals as well as the culture as a whole, the stronger our arguments as to the cause and effects of such behaviour. In particular, with historical remains we have a further advantage: documentary records, which can help further substantiate archaeological findings.

In this thesis, to provide the contextual evidence needed for the comprehensive analysis of violence in medieval London, Chapter 3 syntheses what is already known about violence in the medieval period (and for London in particular) using evidence from the historical record. In Chapter 4, the lives of the individuals interred in each site are elucidated and the potential risks that they would have faced are hypothesised, using both archaeological and historical contexts. Additionally, Chapter 1 outlines the basis of integrating bioarchaeological data with historical evidence and what added information it can provide.

2.1.3 THEORETICAL EVIDENCE

Martin and Harrod (2015) outline one more recourse, that of social theory. In analysing more modern cultures, social scientists create theoretical frameworks through which to interpret their findings. Since archaeology in general encompasses the study of past cultures, it follows that these modern theories could be applied historically. Using these frameworks can help develop a greater understanding of these cultures. In the case of violence, applying social theories can provide us with a deeper appreciation of the cause and effect of fluctuations in the prevalence of violence as well as how it plays a role in the structure of society[9]. Smith (2014: 119) concisely synthesises the necessity for applying social theory to bioarchaeological studies on violence:

> …the question is how do we make inferences that take us from the level of breaks and embedded stone fragments in pieces of bone to begin to move towards an understanding of the character of conflict during relatively remote periods in prehistory? Without such a framework, interpretations cannot move beyond the basic observation that prehistoric people sometimes hit or shot each other, which tells us very little about the society of a given period.

Despite offering significant interpretative advantages to bioarchaeology, this approach has only been used sporadically in previous research (Martin *et al.* 2012b: 1). Many studies have been more empirical in their presentation of data, and while they may include contextual archaeological evidence, they rarely take the extra interpretive step of comparing their findings with current theories on violence (ibid). This is something that should be rectified in future studies, because the more we can support or refute the application of modern social

[9] Examples on how this has been successfully implemented in previous studies are highlighted later on in this chapter.

theories in history, the more we can begin to understand how past societies related to each other as well as to modern life.

In this thesis, the application of specific social theories is difficult as a large and diverse demographic from a broad period of time is under analysis. Choosing one or even a couple of social theories that would adequately apply to the whole of the data would be unwieldy, and potentially inaccurate. How the application of social theory is approached was more concisely outlined in Chapter 1. But, to summarise, instead of trying to pigeonhole the data into one overarching theory, pertinent theories are drawn into specific parts of the discussion (Chapter 8) when relevant to help develop a deeper understanding of a particular aspect of violence in medieval London.

2.2 LIMITATIONS

Bioarchaeology, as with all disciplines, does have its limitations. Perhaps the most constricting is that skeletal data only provides evidence of trauma (or pathology) that affects the bone. An ethnographic study of Turkana pastoralists in East Africa demonstrated that while accidental trauma is common in everyday life, it predominately affects the soft tissue instead of bone (Harrod *et al.*, 2012: 73). This means that the majority of injuries are likely to be hidden from the osteological record. However, this problem may be lessened when concentrating on violence-related trauma. The same Turkana study found that "injuries related to violence seem to be more severe and often result in trauma that affects the bone" (ibid). This difference may suggest that in evaluating accidental and

intentional skeletal injuries there is a potential bias in that the prevalence of violence-related trauma may be overrepresented compared to accidental trauma. There are, however, some instances in which soft tissue trauma does leave its mark on the bone. For instance, certain muscle injuries can lead to osteological changes such as *myositis ossificans traumatica*, which is discussed in greater detail in Chapter 5. But, these changes do not occur with every muscle injury and hence are more the exception than the rule.

Preservation can also severely affect our ability to accurately estimate the prevalence of trauma. Taphonomic, or post-depositional, changes to the bone can mimic, obliterate, or obscure evidence of trauma and/or other pathological lesions (Denys, 2002; Judd and Redfern, 2012; Wheatley, 2008). This means that some instances of trauma will go unrecorded. Additionally, both the completeness of the full skeleton as well as the completeness of each bone can affect our ability to accurately estimate the overall prevalence of trauma (Parker, 2011). This problem can be mitigated by being discerning and detailed in the recording methods and statistical analyses, something that will be talked about in the methods section in Chapter 5. However, unless the skeletons are completely intact with excellent preservation (something that is almost never the case with archaeological remains), there will always be traumas that are missing from the record. That is why it must be stressed that all trauma prevalence rates in this thesis, whether crude or true prevalence, are always minimum numbers.

Regarding identifying patterns of injury, a problem arises in being able to determine the timing of injuries. For instance, if there are multiple antemortem injuries it is difficult to determine whether the lesions occurred simultaneously, indicating one traumatic event, or if the injuries occurred over a period time, potentially indicating a case of injury recidivism (Judd, 2002). Obviously, if there are varying degrees of healing this limitation can be overcome, but in many cases the injuries are fully healed and it is not possible to make any distinction between them. This constraint can restrict our ability to postulate the ultimate cause of trauma. Additionally, unless the injury is perimortem or in the process of healing, it can be difficult, if not impossible, to determine the age at which the injury was received (Maat and Huls, 2009). This can place a further constraint on establishing causality. For instance, if an older, potentially frail, individual presents with multiple healed traumas it can be difficult to determine whether the injuries were due to complications from old age (i.e. osteoporosis, frailty, etc.) or whether they occurred during the individual's youth, potentially indicating another cause such as injury recidivism. In such cases all possibilities should be presented and analysed as to their likelihood.

One way in which this problem has been accounted for is by analysing the likelihood of a particular fracture at a given age. Buhr and Cooke (1959) found that the likelihood of fracturing a particular bone is often age dependent. For instance, hand and foot fractures are often work related and most common among young males, whereas femoral head fractures are more often associated with old age (ibid). Additionally, bone fractures are likely to accumulate with age and different age-at-death profiles between different skeletal collections could

skew overall trauma prevalence rates (Macchiarelli and Salvadei, 1994). Thus, a comparison between age-at-death profiles is a necessity for any comparative analysis in order to be able to detect possible discrepancies, as well as to potentially identify relationships between age and fracture type.

Age limitations are also a setback in being able to identify subadult trauma. There is very little evidence of subadult trauma in the osteological record (Lewis, 2007: 163). This is for several reasons. For one, subadult trauma can be difficult to identify. Children's bones heal more robustly than adult bones and sometimes, without a radiograph, there is no macroscopic evidence of the fracture (ibid). Additionally, unless the individual died during childhood, as noted above, the timing of the injury is often unknown and hence may not be able to be distinguished from trauma that occurred during adulthood. In certain instances, such as fractures to the growth plates, the injury may be able to be identified as a subadult injury even in an adult individual, but these injuries must occur on very specific areas of the skeleton in order to be differentiated (see Chapter 5). A further complication is that individuals who died during childhood may have had a different susceptibility to injury than those who reached adulthood. For example, if a child was often sickly, they were perhaps less likely to have participated in risky activities than their healthier counterparts.

There may also be problems with applying some osteological methodologies to archaeological remains (Martin and Harrod, 2015; Redfern, 2015). Many of the current methods employed in the field are based on clinical and forensic literature. While these studies have greatly contributed to our understanding of

bone trauma, they are not able to fully take into account how violence may vary through space and over time. Redfern (2015: 1) suggests that current methodologies for identifying domestic violence in the osteological record do not fully appreciate "spatiotemporal and socio-cultural diversity present in the archaeological record", a claim that can arguably be applied to much of the methodologies used to identify violence in the skeletal record. Hence, while clinical data can provide us with a helpful guideline in interpreting patterns of violence, it must be acknowledged that the manifestations of violence may have been different historically. That said, robust modelling, which combines evidence from multiple cultures and makes use of historical ethnographies, can help take these potential variables into account and have already been used in creating some methodologies in bioarchaeology (see Ortner, 1991).

In terms of identifying intentional, potentially-violent trauma from accidental injury, there are also complications. How to determine between the two is discussed in greater detail in Chapter 5, but to outline the basics the location of the trauma and the mechanism of injury are usually the two criteria used in determining causality (Walker, 2001). However, these criteria are not absolute. A transverse fracture to the distal third of the ulna is often the result of fending off an attacker. This type of fracture is often called a parry fracture, but in a percentage of cases a similar injury can also result from an accidental fall onto an outstretched hand (Judd, 2008). Hence, many of the methods of identification are based on probability (i.e. which scenario is the most likely). Certainty is difficult to achieve when analysing trauma and, while it is impossible to completely circumvent this problem, by using diagnostic criteria to assess probability and

likelihood we can increase our confidence levels (Appleby *et al.*, 2015b). The specific diagnostic terminology used in this thesis is outlined in Chapter 5.

Additionally, interpretation of violence-related injuries is ostensibly prejudiced toward direct blows to the body. However, one can easily be violently pushed and fall onto an outstretched arm, causing a fracture that is identical to accidental injury. These types of injuries, unless linked with other more secure forms of violence-related trauma such as cranial depression fractures, will elude identification as being caused by violence. This limitation once again stresses how all prevalence rates for violence-related trauma are minimum numbers.

2.2.1 THE OSTEOLOGICAL PARADOX

In palaeodemography studies such as this one, one of the biggest constraining factors is that attritional cemeteries do not necessarily reflect the living population, a problem known as the osteological paradox (Wood *et al.*, 1992). There are three key components to the osteological paradox. The first is *demographic nonstationarity*, which means that a given population is usually never static; it is constantly in flux based on such factors as immigration, emigration, fertility, and mortality rates. As Wood *et al.* (1992: 344) summarise:

> Thus, if a population is not stationary – and changing populations never are – small variations in fertility have large effects on its age-at-death distribution, while even quite large modifications of mortality have virtually none. Paradoxically, then, summary statistics such as life expectancies or the mean age at death are often effectively measures of fertility rather than mortality.

For this study, this paradox does not have major interpretative consequences since there is little focus on mortality rates. However, this is important to take

note of in any demographic study, and it is particularly important to take note of in the assemblages analysed here since medieval London was a large migration centre and is likely to have experienced great influxes in people (Sheppard, 1998: 115; Keene, 1989). This means that the age-at-death profiles for each analysed skeletal assemblage are unlikely to reflect the true mortality rate of the population.

The second part of the osteological paradox addresses the problem of *selective mortality*. As Wood *et al.* (1992: 344) explain:

> We never have a sample of all the individuals who were at risk of disease or death at a given age, but only of those who did in fact die at that age. For example, the only 20-year-olds we observe in the skeletal sample are those who died at age 20. While we may find the skeletons of many of the other individuals who had been at risk of death at age 20 but who died later, say, at age 60, we observe their characteristics as 60-year-olds, not 20-year-olds. As a result, the sample of 20-year-olds (or any other age-group) is highly selective for lesions that increase the risk of death at that age.

This problem means that the observed pathological conditions will be greater than the general population. This can put a constraint on our ability to extrapolate our findings to the living population of the period we are analysing. But, as long as we realise that all observations are likely to be an overestimation of prevalence, it does not put undue constraints on the accuracy of our analyses.

The third part of the osteological paradox is *hidden heterogeneity in risks*. Wood *et al.* (1992: 344-345) state, "hidden heterogeneity means that the population from which the skeletal series is drawn was made up of an unknown mixture of individuals who varied in their underlying *frailty* or susceptibility to disease and death". Because individuals have different mortality risks, due to such factors as

sex, age, social status, and general health, those more at risk (e.g. young children or the elderly) are more likely to die than healthier members of the community (Ortner, 1991; Wood *et al.*, 1992). Linking with *selective mortality*, this means that frail individuals will be more represented in a skeletal assemblage and healthier individuals are more likely to be missing (Milner *et al.*, 2008). Ultimately, as DeWitte and Stojanowski (2015: 406) synthesise, "the fundamental paradox in bioarchaeology is that we are attempting to reconstruct the lives and health conditions of people in past populations by using inherently biased samples of dead individuals".

Both *selective mortality* and *hidden heterogeneity in risks* affect interpretations of health, but how do they affect trauma analysis? This is something that is rarely accounted for in trauma-based studies. Risks of trauma are likely to vary between individuals; and those that are more prone to injury, whether intentional or accidental, may have a greater mortality risk than those more immune to trauma. In which case, like other palaeopathologies, we would expect skeletal assemblages to have a greater number of injuries than the general population. Conversely, there is also the potential for an inverse correlation between risk of injury and risk of disease. Are healthy individuals more or less prone to trauma? If we go back to the earlier example of the sick child, we might assume that a sicklier individual is less likely to participate in activities that may lead to intentional or accidental injuries. Following this assumption, opposite to other pathological bone lesions, we might expect a skeletal assemblage to actually have fewer traumatic injuries than the general population. Potentially supporting this argument is that fact that bone fractures accumulate with age

(Lovejoy and Heiple, 1981). It is usually argued that this is due to the fact that the longer one lives the more time one has to injure his/herself and, while this is likely to be true, it could also be that older individuals may have been "healthier" than the younger individuals represented in the sample and thus had a greater risk of injury.

Which of the above scenarios is correct? Unfortunately, while the osteological paradox and how it relates to health has been extensively studied (DeWitte and Stojanowski, 2015; Wright and Yoder, 2003), its relation to traumatic injuries has been relatively unexamined with many just assuming that trauma can be lumped in with other palaeopathologies or ignoring the osteological paradox completely (see Steyn *et al.*, 2010). This does the study of violence a disservice since in order to make a compelling argument, we must be able to openly discuss ways in which our interpretations can and must be modified. While this particular study does not focus on identifying ways in which the osteological paradox does or does not apply to trauma, it does take it into consideration. In the future, bioarchaeologists should address this issue and perhaps spearhead new research into this area.

The osteological paradox also illuminates how pathologies remain hidden from the skeletal record and those that are discovered may not fully be able to determine the overall health of the individual. It takes awhile for disease to affect the bone, meaning that any individual that presents with pathological lesions is likely to have lived with their illness for a long period of time. This perhaps indicates that the individual is in fact healthier than individuals who died from

their illnesses quicker and whose bones are thus not affected by pathological lesions (Angel, 1975; Harpending, 1990). This is not so much a problem with trauma since injuries to the bone usually occur immediately[10], but it does factor into our overall interpretations of the studied population, particularly in terms of their potential social status, overall health, and how both affect trauma prevalence.

There are additional problems that come with analysing the suitability of a skeletal assemblage to accurately reflect the population of study. For instance, selective mortuary practices that may be biased based on sex, age, or social status (Macchiarelli and Salvadei, 1994). Pertinent questions are: Are all age groups represented, particularly infants? What is the sex ratio of the assemblage and what factors may account for a skewed ratio? Was it expensive to be buried in this particular cemetery thereby precluding the poor from burial? These limitations can be more fully addressed when analysing historical remains. In particular, historical documents can help provide more stable evidence of mortuary practices and the demography of cemeteries. Because of this, Chapter 4 addresses the nature of each analysed cemetery, providing information on who is likely to have been buried at these sites and what parts of the population may be missing.

To summarise, this may seem like a long list of constraints, and they are impossible to completely overcome, but by taking them into account and candidly admitting that the osteological evidence does not unveil the complete

[10] With stress fractures being the possible exception.

picture we can still provide an edifying, more considered analysis of historical injury and violence. One way of re-examining these limitations is to look at them as challenges, a hurdle that needs to be overcome but that does not prevent you from finishing the race. All disciplines have their limitations, but that does not prevent us from significantly contributing to our shared knowledge of history and human behaviour. Below, past research that has greatly added to our understanding of violence, both generally as well as in the medieval period, is reviewed to demonstrate how this has been successfully accomplished in the past.

2.3 PREVIOUS RESEARCH

One of the first studies on bioarchaeological violence dates from the beginning of the 20th century in which the presence of ulna fractures amongst ancient Nubian women were analysed as possible evidence of domestic violence (Elliot-Smith and Wood-Jones, 1910). This study served to show how skeletal remains are relevant to archaeological research and, particularly, how they may be used to interpret violent behaviour. Since then, the study of violence bioarchaeologically has grown significantly (although it still pales in comparison to the literature on palaeopathology and health). In particular much of the work has focused on intergroup, or collective violence, specifically identifying trauma caused by warfare and more small-scale conflicts (Armit *et al.*, 2007; Carman, 1997; Fibiger *et* al., 2013; Knüsel, 2005; Knüsel and Smith, 2014; Martin *et al.*, 2012a, Schulting, 2013; Schulting and Fibiger, 2012). In comparison, studies focusing on intragroup, or interpersonal, violence have been relatively few, although this is

beginning to change as bioarchaeologists become more confident in identifying signs of interpersonal violence in the osteological record (Kjellström, 2014; Lessa and Mendonça de Souza, 2004; Šlaus *et al*, 2012). Below, the main findings of bioarchaeological research into violence, both collective and interpersonal, are reviewed with the focus particularly on previous studies of medieval remains.

2.3.1 COLLECTIVE VIOLENCE

Evidence of warfare, and other forms of collective violence in the skeletal record, has been analysed from the late Palaeolithic through to the modern era (Armit *et al.*, 2007; Carman, 1997; Fibiger *et* al., 2013; Knüsel, 2005; Knüsel and Smith, 2014; Martin *et al.*, 2012a, Schulting, 2013; Schulting and Fibiger, 2012, etc.). One of the earliest examples of violence comes from human remains excavated near Lake Turkana in Kenya, which date to around 10,000 year ago (Mirazón Lahr *et al.*, 2016). Out of twelve complete skeletons, ten displayed evidence of extreme violence suggestive of "overkill". The authors suggest that the injuries are evidence of violence between two different hunter-gatherer groups and helps cement the argument that prehistoric hunter-gatherers were not immune to warfare (ibid). Studies such as this one on prehistoric remains are some of the only forms of evidence we have of violence in our ancient past, and they are able to tell us how violence was structured in a particular culture and how it may have changed over time. Skeletal evidence from historic times can be used to provide similar evidence, but it can also be used to either support or refute documentary records (as highlighted in Chapter 1).

For the medieval period, some of the most comprehensive studies addressing violence have focused on the analysis of mass graves from battle sites. The largest studies have analysed skeletons from the Battle of Towton (Fiorato *et al.*, 2000), the Battle of Wisby (Inglemark, 1939), the Battle of Good Friday (Kjellström, 2005) and the Battle of Dornach (Cooper, 2010). All four studies used the skeletal evidence of injuries to analyse medieval warfare. In particular, they hypothesised what weapons and fighting styles were common of the period as well as the types of injuries present and their severity. Overall, the four studies seem to show that bladed weapons appear to have been the most commonly used in battle and that medieval soldiers tended to favour frontal assaults. But, there is also significant evidence for more unstructured fighting techniques, particularly in the Battle of Good Friday in which there was a large disparity between the professionalism of the soldiers from each side (Kjellström, 2005). The different studies also suggest that most assaults targeted the head, with the substantial amount of post-cranial injuries amongst the Battle of Wisby individuals being the possible exception[11].

These studies provide us with direct evidence of medieval warfare, one that before could only have been hypothesised by personal accounts from either soldiers who witnessed the battles or sometimes even second-hand chroniclers who merely recorded what they had been told occurred. Often the veracity of these accounts is uncertain and these osteological studies helped to confirm or deny their authenticity. The demography of these mass graves also provides information as to the make-up of soldiers, particularly their sex (male), age

[11] This difference is analysed further below in Knüsel's (2014) research.

(relatively young), relative health (varied), and past injuries (common in the Battle of Towton and Battle of Good Friday). In particular, antemortem injuries found on individuals from the Battles of Towton and Good Friday suggest that some soldiers are likely to have participated in previous battles and survived, seasoned warriors (Novak, 2000: 94-95; Kjellström, 2005: 36-37).

Inglemark's (1939) assessment of the Battle of Wisby (1361), a battle fought between the native Gutnish yeomen and the invading Danish royal forces on the island of Gotland in modern-day Sweden, was truly ground breaking. It was one of the first studies to carry out a comprehensive analysis of weapons-related trauma and made a novel attempt at hypothesising weapons from the size and shape of the skeletal lesions. However, as it is an early study, it lacks more modern methodologies in identifying perimortem injuries, particularly those caused by blunt-force weapons. As Inglemark noted (1939: 191): "Injuries from [a mace] are extremely difficult to identify, because they generally completely crushed the bone or cranium, an injury, which cannot possibly be distinguished from the damage done to the skeletons while they were lying in the grave". However, newer methods have now determined that it is possible to distinguish between the two, meaning that many of the injuries that the soldiers from the Battle of Wisby suffered may not have been reported in Inglemark's study.

Novak's (2000) assessment of the Battle of Towton (1461), fought as part of the War of the Roses between the houses of Lancaster and York, is one of the most important modern studies on weapons-related trauma in skeletal remains. While Inglemark (1939) attempted to match up injury characteristics with certain

medieval weapons based on size and shape, no specific methodology was used. Novak's (2000) was one of the first studies to use scientific experiments to determine which weapons may have caused specific injuries, particularly puncture wounds. Using these techniques, she goes on to identify possible weapons that could have caused the observed injuries. As such, it is one of the most heavily cited studies regarding the identification of weapons-related injuries (see Appleby *et al.*, 2015a; Cooper, 2010; Kjellström, 2005; Powers, 2005). Still, some of the materials used in the experiments, such as acoustic ceiling tiles, are crude proxies for bone and the accuracy of these methods has not been fully tested.

The site from the Battle of Good Friday (1520), which took place in Uppsala, Sweden between Swedish and Danish armies, while not necessarily adding to the methodology of weapons identification, helped to confirm Novak's (2000) findings. Kjellström (2005) found that, like Towton, most of the individuals were young (25-34) males that presented with a large amount of sharp force trauma to the skull. There were also a small number of antemortem injuries that were consistent with individuals who would have had previous experiences in battle (ibid). However, unlike Towton, which showed a preponderance of injuries to the left side of the cranial vault, there was no such pattern on the Good Friday crania. Kjellström (2005) suggests that this shows a more unstructured fighting technique and that the battle was not necessary fought face-to-face. This result provides necessary insight into the importance of injury patterning.

In an attempt to provide more accurate methodologies on weapons identification, Cooper (2010) used forensic tools to try to recreate weapons trauma from the Battle of Dornach (1499), a battle between Emperor Maximillian I of the Holy Roman Empire and the Old Swiss Confederacy. Specifically, she used simulated crania made out of polyurethane to recreate the three-layer structure of cranial bones, including the outer table, the diploë, and the inner table. Additionally, the polyurethane sphere was then covered in latex to simulate the periosteum, then a layer of plasticine to simulate the scalp, and finally the inside of the sphere was filled with gelatin to mimic the brain (ibid: 52). While even this is not a perfect proxy for bone, it comes closer than acoustic ceiling tiles. In order to recreate an assault, the sphere was attached to a bendable pole to reflect the flexibility of the human body and then struck with medieval weapons. Although the recreated wounds did not exactly replicate the real injuries found on the skeletons from Dornach, Cooper (2010: 152-53) found that they were close enough to be able to determine with relative accuracy which weapons were likely to have produced which type of injury.

There is one more battlefield mass grave that has been analysed and the results published from the later medieval period, that of the Battle of Aljubarrota (1385) in Portugal, which took place between the Portuguese and Castilians (Cunha and Silva, 1997). The remains from the site were quite fragmentary, however, with mainly long bones and only a few skull fragments surviving. As such, the analysis is not as comprehensive as the studies cited above. Nevertheless, the results still provide useful information on medieval warfare. One interesting find was of a humerus that showed signs of having been amputated. As the cut was fully

healed, this suggests that the individual fought in a major battle with only one arm (perhaps suggesting why he did not survive). Cunha and Silva (1997) do not provide much analysis on the consequence of this find, but it would be interesting to look at why such a severely disadvantaged soldier would still be participating in battles. This individual was not the only one with old war wounds. Similar to Novak's (2000) and Kjellström's (2005) findings of the antemortem warfare injuries from Towton and Uppsala, there were several long bones from Aljubarrota that presented with healed cut marks, suggesting that many of the individuals excavated from this site appear to have been battle-hardened warriors. In the medieval period, warfare appears to have been a career for some men.

Apart from large-scale analyses of battle site mass graves, there have been several studies that have analysed possible evidence of warfare from attritional cemeteries. These have tended to focus on either one individual or small groups of individuals that present with perimortem weapons-related injuries. One of the most famous cases is the discovery of Richard III in 2014 (Appleby *et al.*, 2015a). This research serves as an excellent example of combining the historical record with the bioarchaeological evidence. Evidence from the skeleton such as the age, physical build, and pathological features were compared to historical evidence of Richard III. For instance, through historical documents, it is thought that Richard died at the age of 32 and that he was most likely small of build and had a back deformity, with the right shoulder higher than his left[12] (Rous, 1716: 216). The

[12] *Parvæ staturæ erat, curtam habens faciem, inæquales humeros, dexter superior sinisterque inferior* (Rous, 1745: 216).

osteological evidence showed that the possible skeleton of Richard III was aged 30-34, fairly gracile, and the spine displayed evidence of scoliosis, which was likely to have made his right shoulder higher than his left (Appleby *et al.*, 2014; Appleby *et al.*, 2015a). Thus, in this case the osteological evidence was able to support the historical evidence.

Apart from confirming the historical record, Richard III's remains were also able to provide new evidence relating to his death and the treatment of his body afterwards. Due to the patterning of the wounds, primarily found on the skull, Appleby *et al.* (2015a) suggest that prior to death his helmet was removed and that two possible deathblows came to the inferior aspect of the skull on the occipital bone, meaning that he was possibly struck from behind. A large bladed weapon(s) potentially inflicted the injuries with possibilities ranging from a sword to staff weapons, such as a bill or halberd. Since there is a distinctive lack of defensive injuries to his upper limbs, this pattern may suggest that the rest of his body was still armoured (ibid).

One of the most interesting finds, however, is the sharp force lesion to the right pubic ramus. Appleby *et al.* (2015a) conclude that this injury would not have been possible while the individual was armoured or while on a horse. Thus, the injury must have occurred after the individual had been unseated and striped of his armour. They go on to hypothesise that this injury may be evidence of the body's desecration after death, particularly as the injury was likely caused by a stab wound to the buttocks (ibid). Apart from helping to provide greater detail about the death of Richard III, this research also provides invaluable evidence of

medieval battle injuries. This detailed examination will help future research, specifically in terms of medieval weaponry identification, analysing patterns of injury, and the medieval treatment of the victims of battle, particularly the losers.

Other studies of attritional cemeteries have focused on sites that uncovered small groups of individuals with perimortem weapons-related injuries. For instance, Brødholt and Holck (2012) argue that the injuries observed on men (although a small number of women and children were also affected) from the Royal Church of St Mary in Oslo may be linked to the civil wars in Norway during the 12th and 13th centuries. While Brødholt and Holck (2012) analysed an attritional cemetery for their research, the analysis, ostensibly based on the types of injuries observed, focused on perimortem weapons-related injuries and how they may be attributed to warfare. They found that the majority of injuries appear to have been caused by a sword and, similar to the battlefield mass gravesites highlighted above, they found that they primarily affected the skull, providing further evidence that the head was the main target of medieval warfare. Additionally, as with the Battles of Towton, Good Friday, and Aljubarrota, several men presented with antemortem weapons-related injuries, suggesting that many of the affected men were seasoned soldiers (ibid).

Another such example of battle trauma in an attritional cemetery is the site of St Andrew, Fishergate in York (Stroud and Kemp, 1993). There, male individuals from the later monastic cemetery (late 13th to 14th century) and particularly the earlier parish cemetery (late 10th to 12th century), presented with a high number of perimortem sharp force injuries that predominately affected the lower limbs:

55.9% for the early cemetery and 18.2% for the later. This is in stark contrast to most of the research outlined above, apart from the Battle of Wisby, which shows that the vast majority of perimortem weapons-related trauma affected the skull. Although Stroud and Kemp did not attempt to identify the event that caused these weapons injuries, it has been suggested that the injuries from the earlier parish cemetery might have been from either the Battle of Stamford Bridge or the Battle of Fulford, two skirmishes that took place close to Fishergate between the Saxons and the Vikings in the 11th century (Knüsel, 2014: 268).

Another study that found a preponderance of post-cranial weapons-related trauma is the one conducted on two early medieval sites (400-1200 AD) from Ireland: Mount Gamble in County Dublin and Owenbristy in County Galway. This study successfully demonstrated how patterns of violence can differ between two populations that are temporally and geographically similar (Geber, 2015). While the neck and torso were targeted in both populations, the types of weapons trauma differed, with sword and axe wounds more common in the Owenbristy site and knives or spears more common in Mount Gamble. Geber (2015) argues that the difference may be explained by the fact that the individuals from Mount Gamble may have been more highly trained for warfare, whereas, in contrast, the individuals from Owenbristy may have been "unprotected and unprepared" for battle. Overall, this study serves as an example of how extrapolating the evidence of one site to an entire region may be incorrect and that it is important to conduct studies on all available assemblages even if they appear to be culturally similar.

In an attempt to collate some of the data highlighted above and flesh out common themes, Knüsel (2014) analysed the results from the Battle of Towton (Novak, 2000), the Battle of Wisby (Inglemark, 1939), the Battle of Good Friday in Uppsala Sweden (Kjellström, 2005), and the attritional cemeteries from St Andrew Fishergate, York (Stroud and Kemp, 1993). He then combined the skeletal evidence with evidence from medieval fighting manuals and found that there was a temporal shift in the pattern of injuries. In the earlier sites, from Fishergate and Wisby, many of the injuries affected the post-cranial skeleton, particularly the limbs. In contrast, the individuals from the later sites, including Towton and Uppsala, presented with perimortem weapons trauma concentrated on the cranio-facial region. The reason for this shift, Knüsel (2014: 272) argues, is most likely to do with "the presence of paid and increasingly specialized soldiery, influenced by a military culture that encouraged much more lethal weapon use against armies…". As this shift is in direct opposition to the battle tactics outlined in Talhoffer's fighting manual, the difference may indicate that the tactics were disregarded, perhaps because their opponents were deemed too treasonous to deserve mercy (ibid: 271). Overall, this study is a prime example of how combining evidence from different sites and time periods can help us develop a more comprehensive picture of medieval violence.

Sometimes the lack of warfare-type injuries can be as informative as the presence of them. Mitchell (2006), through his analysis of human remains from the fortified city of Caesarea in modern day Israel during the Crusader period (12th-13th century), found that out of 46 remains, not one displayed any weapons-related injury. He argues that despite living in a war-torn region, the

individuals from Caesarea may have been immune to warfare either due to the city's location deep within Frankish territory, and hence was not a major point of conflict, or that the city defences were successful at keeping out possible invaders. This research is an excellent example of how bioarchaeological studies on violence can be used to disprove (or confirm) popular historical perceptions.

2.3.2 INTERPERSONAL VIOLENCE

In contrast to collective violence, interpersonal violence produces more nuanced injury patterns and may be less easily distinguished from accidental injuries (Martin and Harrod, 2015: 131). However, the methodologies do exist (as outlined in Chapter 5 and discussed briefly above) and while there is always a degree of uncertainty, it is important to attempt to ascertain the different causes of injury since it allows for a more considered interpretation of violence. In particular, it is important because assessing signs of interpersonal violence in a community can inform on the stability of that society. In modern populations, economic, political, and other social tensions can lead to an increase in violence (Fox *et al.*, 2002; Sampson and Groves, 1989), and some bioarchaeological studies have shown it to be true historically as well. For example, Lessa and Mendonça de Souza (2004) compared violence-related trauma between two different prehistoric periods in the Atacama Desert in Chile. They found that individuals from the pre-Tiwanaku period had significantly fewer injuries, particularly violence-related ones, than individuals from the Tiwanaku period, specifically amongst males, aged 20-30. Since the Tiwanaku period was characterised by a radical shift in culture with a greater division between

different social statuses and an increased emphasis on religion that "reorganised" social relationships, Lessa and Mendonça de Souza (2004) convincingly argue that the increase in violence during this time is evidence of this cultural shift and an increase in tension between different social groups.

Lessa and Mendonça de Souza's (2004) research provides an interesting example of how social theories can be applied to osteological studies with great effect. It also serves to show how important identifying and assessing interpersonal violence in the skeletal record can be, as it can provide us with a deeper understanding of a specific culture, particularly when that society is in flux. Unfortunately, very few studies have attempted to identify signs of interpersonal violence in the medieval period apart from two key studies, which are discussed below. Battle-site injuries can provide us with exceptional information on medieval warfare tactics and practices, and have greatly contributed to our ability to identify weapons-related injuries as well, but in order to develop a deeper understanding of how violence was integral to medieval society, interpersonal violence needs to be more heavily studied.

One of the most comprehensive looks at the complexities of violence in society is the study conducted by Šlaus *et al.* (2012) in which they analysed over 1,000 skeletal remains excavated from modern day Croatia and Bosnia and Herzegovina that date from three distinct time periods: 2nd-6th centuries, 7th-9th centuries, and 12th-16th centuries. Similar to research in this thesis, they studied all aspects of violence, both collective and interpersonal. As with other medieval studies, they found a preponderance of skull injuries, suggesting that the head

was the main target for violence. Their most intriguing finding, however, was a temporal increase in the total fracture frequencies, as well as in violence-related fracture frequencies, with the skeletons from the later medieval period presenting with the highest frequency. They argue that this trend was likely caused by a transition in lifestyle "from a relatively affluent AN [antiquarian] urban lifestyle to a more primitive rural medieval way of life" (Šlaus *et al*, 2012: 26).

While Šlaus *et al*'s overall findings are compelling, their argument is a bit lacking in nuance. Their assertion that the increase in intentional violence may be due to a number of armed conflicts that occurred during the later medieval period appears to be a more convincing argument, but they quickly glide over it and instead focus on the more "primitive" behaviours of the medieval populace, and do not address the causes of such conflicts in the first place. Certainly, a case can be made for a less "civilised" medieval lifestyle in comparison to antiquarian Mediterranean society but, without knowing much about the medieval era in the East Adriatic, just painting the period as primitive does not help us gain a deeper understanding of how and why violence (as well as other accidental injuries) may have increased. This thesis hopes to avoid such a generalisation by painting an in-depth picture of life in medieval London in the hopes of avoiding medieval stereotypes that were discussed in Chapter 1.

For the medieval period, Kjellström (2014) has provided one of the few poignant accounts on interpersonal violence in her analysis of skeletal assemblages from two Swedish population centres, Sigtuna (950-1500) and Västerhus (1070-

1350). It is unique in that it is one of the few studies that offers a comparison between different attritional cemeteries contemporary to each other and also provides a more comprehensive, and less descriptive, analysis of her findings. In terms of her main results, which may be a useful point of comparison for the results in this thesis, in both sites the skull appears to have been the main target of violence with men being the most affected. She also found that while the injuries on males from Sigtuna were characterised by sharp force trauma, the injuries from Västerhus were characterised by blunt force trauma to the cranial vault. This high level of blunt force trauma (2.7% of the total population) at Västerhus is never fully discussed by Kjellström, but it is interesting discovery as it may show a difference between structured collective violence (which the sharp force trauma in Sigtuna may by the result of) and more unstructured interpersonal violence. She also found that despite violence against women being "normalized according to the historical records" (ibid: 245), only two women (both from the Sigtuna collection) presented with lesions that might be considered violence-related, suggesting that if violence against women did occur it did not affect the skeleton.

In an attempt to look at various social groups represented in the population, Kjellström also compares the individuals who presented with violence-related injuries with other palaeopathological lesions, specifically focussing on signs of enamel hypoplasia and *cribra orbitalia*, both of which may indicate periods of malnutrition in childhood. While not completely conclusive, the individuals with violence-related injuries from the Sigtuna site presented with a slightly lower number of malnutrition lesions than the rest of the Sigtuna population.

Kjellström suggests that this may indicate that the Sigtuna adult "warriors" may have been brought up in a higher socioeconomic status. No such dichotomy was discovered in the Västerhus population, further suggesting a difference in the origin of violence between the two sites.

In her analysis of the impact of these findings, Kjellström (2014) applies the feminist theoretical framework of intersectionality, which asserts that "social identity is in constant interaction with different, both defined and hidden, individual attributes of power such as sex, gender, ethnicity, sexuality, economic and marital status, physical and mental health" (ibid: 239). In other words, an individual, as well as a particular social group, can encompass many identities at once, and in order to understand that person (or group) we must analyse the sum of these identities and not the individual parts. Despite an interesting working theory, she never fully makes the connection between the framework and her findings. She picks up on differences in the patterns and prevalence of violence between the sexes and between those of different social status, laying out arguments as to the cause, but it is never developed more deeply. While it is an admirable goal, the end result seems like the theory was applied merely for the sake of applying a theoretical framework, instead of offering new insight into the interpretation of these injuries. For instance, one of the main conclusions is that "the gendered violence shows that as an intersectional parameter, sex seemed to have played a more significant role than, for example, social status" (ibid: 245). This finding is almost in opposition to the foundations of intersectionality, which argues that no identity supersedes another, that instead they are inextricably linked (DeFrancisco *et al.*, 2014: 9).

This misapplication of theory highlights a potential problem with the bioarchaeological application of modern theoretical frameworks in general, mainly that archaeological evidence (even when combined with the historical record), is not able to provide a complete enough picture to be able to successfully employ certain theories. Still, this does not preclude the use of social theories, but merely indicates that one should be discerning when using such frameworks and that, perhaps, using several theories for different aspects of violence is better than using one overarching theory. This methodological problem does not affect Kjellström's findings, however, which still provide a laudable analysis of medieval Swedish violence and how it differs based on sex and social status.

2.3.2.1 DOMESTIC VIOLENCE

Going hand-in-hand with interpersonal violence is domestic violence. Identifying signs of domestic violence has always been of interest in bioarchaeological research, although establishing the right methodology has been problematic (Redfern, 2015). In order to distinguish between domestic violence and accidental injury, Novak (2006) created a statistical model that was based on modern cases of domestic violence taken from hospital records in the United Kingdom. This model emphasises the age, sex, and location of injuries, putting a heavier weight on young female individuals with multiple head and face injuries, but few or no injuries to the extremities. However, Novak's application of the model on a small archaeological collection demonstrates how heavy handed this model is. All of the analysed female skeletons (five) presented with maxillofacial

or cranial fractures and the model classified four out of the five as being caused by domestic violence. The last female presented with a depression fracture to the posterior parietal and the model was not able to distinguish between domestic violence and accidental injury.

"Reading" patterns of domestic violence, Redfern (2015) argues, is not as clear-cut as a "clustering of head, face and neck injuries in young adult women", characteristics that the Novak model is based on. While this pattern may be predictive of domestic violence, the forensic literature suggests that there is no specific fracture pattern that can be diagnostic of domestic violence (Juarez and Hughes, 2014: 361), and certain predictive injuries may only be hypothesised as consistent with domestic violence[13]. Additionally, while young women have been identified as the population most at risk of domestic violence, using age and sex as diagnostic criteria misses the fact that men and older women can also be victims (Redfern, 2015).

In particular, Redfern (2015) cautions that it is often difficult if not impossible to distinguish between injuries caused by domestic violence and those from different types of abuse. She also emphasises that "it is imperative that DV [domestic violence] is not studied in isolation from a community's notion of gender, life course and evidence for other types of violence (child abuse or warfare)" (ibid: 15). Taking Redfern's argument into consideration, it would seem that domestic violence can (and should) always remain a possible

[13] More information on the terms used to define confidence in violent-injury identification can be found in Chapter 5.

explanation for certain patterns of injuries that may fit into predictive domestic violence patterns, but it should never be the sole explanation, something which is likely true for all explanations of violence-related injuries.

Perhaps in light of the identification difficulties, very few studies have attempted to distinguish domestic violence from other forms of interpersonal violence, even as a possible alternative explanation for injuries. There was the early Elliot-Smith and Wood-Jones (1910) study that was highlighted above and Novak's (2006) application of her model in which she analysed a small sample of skeletons from Caldwell Village (~11th century) in Utah, but there has not been much more advancement in this area. For the medieval period, no evidence of domestic violence has been hypothesised at all. This is likely exacerbated by the fact that there have not been many studies conducted on attritional cemeteries (see above) and of those that have been done very few females have been affected by injury. While it may not be possible to securely identify injuries caused by domestic violence, more studies that focus on differences between the sexes should be conducted as they might be able to indicate if violence against women was prevalent or not, and what may or may not have been the cause.

2.4 CONCLUSIONS

Overall, previous bioarchaeological studies demonstrate that violence is not a simplistic behaviour that is easily analysed and interpreted. Instead, the discipline has discovered that "violence is found in a wide variety of forms and expressions, and it appears to be historically contingent and specific to time and

place" (Martin and Harrod, 2015: 117). The past research addressed above also highlights why a biocultural approach to bioarchaeology that integrates the cultural and environmental context (ibid) – and in the case of historical remains, the historical record – is imperative in gaining as complete a picture of violence and its impact as possible. Therefore, being able to analyse the full spectrum of violence in medieval London based on the skeletal evidence is a huge and complex undertaking that is contingent upon successfully applying the integrative approach outlined above.

As may have been noticed, most of the medieval studies cited above have taken place in the last ten years. While slowly more osteological studies are beginning to be done in this area, we are still a long way away from having a comprehensive understanding of medieval violence as interpreted through the skeletal record. Ostensibly, previous work on violence has focused on the prehistoric eras, mainly due to our complete lack of understanding of the presence of warfare and violence during those periods. But, as outlined in Chapter 1, violence was a crucial aspect of medieval society and thus plays an important factor in being able to understand that society. Osteological analyses of both collective and interpersonal violence from this period can help us provide a richer understanding of how violence was used to assert power and dominance, as well as how the medieval population was likely to have been affected by it. Yet, most of the past research has focused on evidence of warfare, with little focus on interpersonal violence. This study hopes to add to this body of research by expanding our knowledge of violence in medieval London. It also aims to set precedence for future research into medieval violence in general with

the anticipation that this will lead to the development of a more complete picture of how violence, both collective and interpersonal, varied across medieval Europe and throughout the medieval period.

CHAPTER 3: VIOLENCE IN MEDIEVAL LONDON

This chapter briefly outlines the historical evidence of violence in medieval London. As highlighted in the previous chapter, contextual evidence such as this is a necessary component of the biocultural approach to studying violence bioarchaeologically. Specifically, in order to correctly interpret evidence of medieval violence in the skeletal record, it is imperative to have a general understanding of what forms of violence may have been common during this time, what weapons were likely to have been used, and what types of injuries may have been characteristic of these behaviours. In particular, potential dissimilarities between the sexes and those of different social status are highlighted, as these are demographic categories that will be used to analyse the osteological results of this research (see Chapter 1). Possible patterns in time, another category analysed in the results, are more difficult to appreciate through the historical record, but are briefly touched upon here. Additionally, it is important to know what gaps in knowledge the historical evidence might leave, and how the osteological evidence might be able to fill them in. These are also elucidated in this chapter.

It should be noted that a complete recounting of all historical evidence of violence in medieval London would take more time and space than this thesis is able to provide, and it is unnecessary for the purposes of this research. Instead, pertinent examples that provide context for later interpretations are the main focus of this chapter. As outlined in the introduction, violence can take many forms, and this chapter attempts to highlight the different types of violence one

might expect medieval Londoners to have been party to. Violence can be broken down into two main types: interpersonal violence, which includes community-based and domestic violence, and collective violence, which includes larger scale conflicts between groups. This chapter tackles both forms separately, highlighting the different behaviours that appear to have been characteristic of each.

3.1 INTERPERSONAL VIOLENCE

Interpersonal violence is defined as personal conflicts between individuals. It can be found in either a community or domestic setting, and both are discussed here. Community violence is addressed first, highlighting patterns of violence based on timing and social status. How the prevalence of community violence may differ between men, women, and children is particularly emphasised, as this is important to the interpretation of skeletal evidence for violence. Prisoners are given their own section, as the type of violence that they faced was irrespective of their gender or age. Evidence of domestic violence is addressed last, and particularly focuses on women and children considering they are the populations most at risk of such behaviour.

Out of necessity, this section heavily focuses on homicides, instead of non-fatal types of violence, mainly because it is the type of violence that was most often prosecuted in medieval London and hence appears most frequently in the historical records. As such, our current understanding of non-fatal violence in medieval London, and indeed for the whole of the medieval world, is severely

lacking. Personal accounts, chronicles, literature, and instructive manuals provide some recourse, and are addressed in this chapter when relevant, but as these are often second or third hand accounts, their accuracy is unknown. It should be noted that this is a major gap in the historic record that the osteological evidence might be able to fill.

The main records used in this section include the eyre and coroners' rolls, which provide the most evidence of interpersonal violence in medieval England. In London, the survival of these rolls is rather limited with only eight full coroners' rolls from the 14th century and two eyre (or court) rolls from the 13th century in existence. This means that historical evidence for medieval interpersonal violence prior to the 13th century is almost non-existent and how successfully the evidence from the London rolls can be extrapolated to other periods of time is unknown. As the 14th century was a particularly turbulent century, with numerous periods of war, famine, and plague, it may be argued that violence may have been more prevalent during this period than during other centuries of the Middle Ages, something which must be taken into consideration when analysing the data from the Coroners' Rolls. That said, the inquests found in the rolls are incredibly detailed, giving information on such things as the time, location, names of the perpetrators and victims, motive, and types of weapon. As such, they give the best idea of the characteristics of interpersonal violence in medieval London, and are, consequently, heavily drawn upon in this section.

Outside of London a larger amount of court and coroners' rolls survive, and they can help to fill in some of the gaps in time left by the London rolls. These sources

are drawn upon when the London data is lacking, as the issues raised in other jurisdictions, particularly other urban centres, may have been similar. But they, like the London rolls, are often limited in scope, and are also biased in their recording of certain types of death over others.

It should be noted that all of the data mentioned in this thesis regarding the London Coroners' Rolls was compiled by the author using Sharpe's (1913) translation. As such, this information will only be cited when specific inquiries from the rolls are mentioned. The database used for this analysis can be found in a catalogue at the end of the thesis.

3.1.1 COMMUNITY VIOLENCE

The World Health Organization defines community violence as "violence between individuals who are unrelated, and who may or may not know each other, generally taking place outside the home" (Krug *et al.*, 2002: 6). This definition includes random acts of violence, sexual assault, and institutional violence such as that which may take place in a prison, school, or work place. For the 14th century at least, documentary evidence for community violence in medieval London is plentiful, although biased towards certain violent acts. For instance, there is a wealth of information on homicide, which is discussed at length below, but, as mentioned above, significantly less so on rape and other types of non-fatal assault.

Previous analysis of the London Coroners' Rolls has estimated that the prevalence of homicide in 14th century London was between 52 and 36 per 100,000 people (Hanawalt, 1976: 301-302). This is a rather alarming figure considering the modern prevalence of homicide in London is 1.6 per 100,000 (Osborne *et al.*, 2012). However, the data collected from the Coroners' Rolls during the course of this research came up with different overall numbers than those estimated by Hanawalt (1976). Using this data and an estimated population size of 80,000 for medieval London in the beginning of the 14th century (Billings, 1994), the adjusted prevalence of homicide in medieval London can be estimated at 22.19 homicides per 100,000 people. This number is still quite high compared to modern London, but is still much lower than some modern cities, including Detroit (48/10,000) and Cape Town (41/10,000; Osborne *et al.*, 2012; United Nations Office on Drugs and Crime, 2011: 79; United States Department of Justice, 2011).

This new estimated prevalence is in stark contrast to Hanawalt's original estimate. The difference is mainly due to the fact that Hanawalt used a gross underestimation of the population size of early 14th century London: 35,000-50,000, which she cited from L.O. Pike's *A History of Crime in England* (1873). The new prevalence estimate, with a more accurate population estimate taken from Billings (1994), is more in keeping with the smooth downward curve for historical homicide rates in London that Eisner (2003) observed[14], making medieval London no longer an outlier in his findings. Overall, this reassessment

[14] As highlighted in Chapter 1.

of the Coroners' Rolls suggests that, if accurate, 14th century London was most likely quite violent, but still in keeping with larger trends.

The quantitative analysis of the rolls carried out for this research found that there was a total of 140 full homicide inquests recorded in the eight complete London Coroners' Rolls, representing almost half (48.7%: 140/287) of all untimely death inquests (Table 3.1). Across the whole of England, homicide was the third most reported crime in the 14th century, representing 18.2% of all cases recorded in the gaol delivery rolls (Hanawalt 1979: 97). Using the 13th century eyre rolls, Given (1977: 40) concluded that homicide was a frequent occurrence and that "it is possible that every person in England in the thirteenth century, if he did not personally witness a murder, knew or knew of someone who had been killed". At a glance, these numbers suggest that homicide was a common crime in medieval England, causing more deaths than accidents. Although it should be noted that homicide was considered a most egregious act, and therefore may have been reported more than other crimes or accidental deaths. This means that how it actually compares to the prevalence of other criminal transgressions remains uncertain.

The conditions under which homicide was likely to occur are well documented within the London Coroners' Rolls. As per these records, 14th century London homicides mainly occurred on Sunday nights, during the warmer months of the year. All but eight of the homicide inquests occurred between dusk and midnight. Of the eight that did not occur within this time, five were during the early morning hours and the other three occurred during midday. Homicides also

appeared to increase throughout the week with the number peaking on Sunday, remaining high on Monday and then dropping off significantly by Tuesday (Table 3.2). Together, these figures show a consistent pattern of homicide most often occurring on either Sunday night or early Monday morning. As Sunday was the day of rest and many spent their time after church in the local tavern drinking and playing games (Mount, 2015: 174), these figures are not unexpected and may suggest that leisurely activities, and the increased use of alcohol, could have fuelled violence.

Table 3.1: Number of deaths recorded in the London Coroners' Rolls by Year and Classification

YEAR	HOMICIDE	MISADVENTURE	SUICIDE	ILLNESS	PRISON	TOTAL
1300-1301	14	8	0	7	0	29
1321-1322	15	11	2	0	23	51
1323-1324	14	2	0	0	2	18
1324-1325	22	5	0	0	9	36
1325-1326	23	4	0	0	15	42
1336-1337	14	13	0	0	3	30
1338-1339	19	9	0	7	7	42
1339-1340	19	12	1	6	1	39
TOTAL	**140**	**64**	**3**	**20**	**60**	**287**

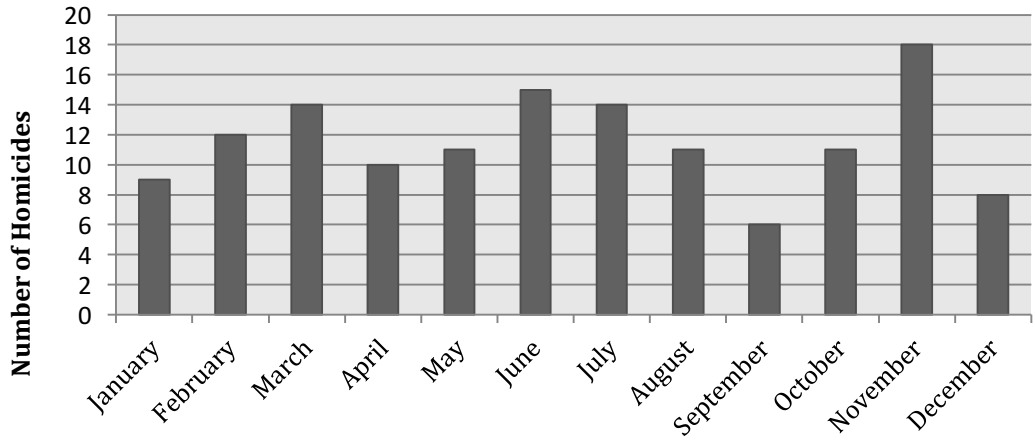
Table 3.2: Number of Homicides by Day of the Week

DAY OF THE WEEK	# OF HOMICIDES	% OF TOTAL (N = 140)
Monday	29	20.7%
Tuesday	8	1.4%
Wednesday	13	9.3%
Thursday	13	9.3%
Friday	14	10%
Saturday	14	10%
Sunday	48	34.3%

While the numbers of homicides by month were, comparatively, evenly distributed, there was a distinct decrease in murders during the months of December and January, possibly due to the weather keeping more people indoors and off the streets (Figure 3.1). September had the lowest number of recorded homicides, but this is most likely due to the fact that the coroners' roll

for the year starts at Michaelmas in mid-September. As many of the surviving rolls are not continuous, much of the September data, particularly from the first half of the month, are missing from the record. However, as the overall numbers are quite low and no clear patterns emerge, these small observed flucations may merely be due to chance.

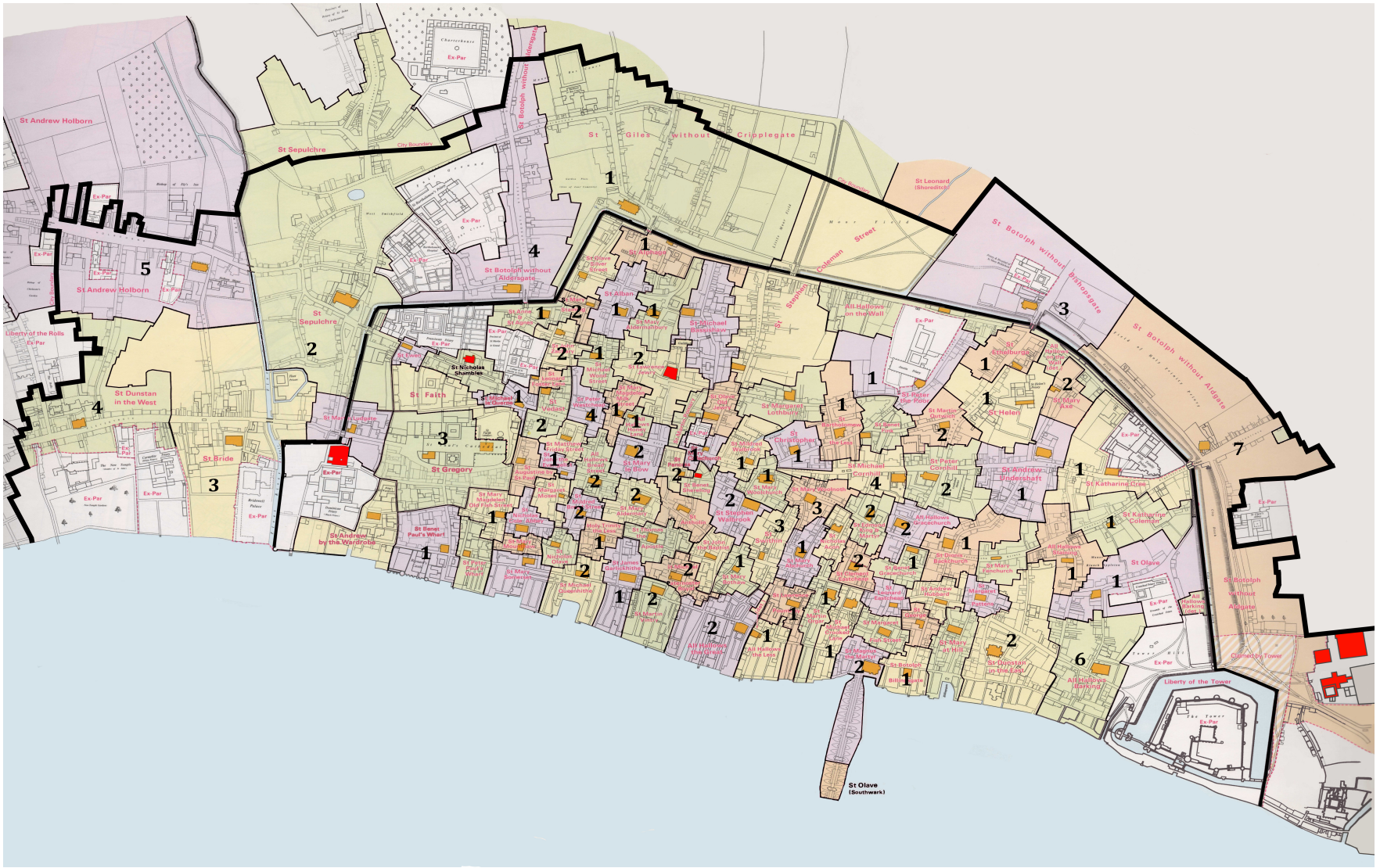
Figure 3.1: Number of Homicides recorded in the London Coroners' Rolls by Month



In terms of geographical location, many of the homicide inquests were relatively spread out across the City of London and its surrounding suburbs. The map in Figure 3.2 shows the full distribution of homicides by parish. Since the parish areas are smaller than the wards, patterns in location are easier to distinguish. In all, there were a few areas where no homicides were recorded, including the entire ward of Bassishaw in the north of the City. There were also very few homicides recorded in the areas surrounding Bassishaw, including the wards of Coleman Street and the northern area of Cheap[15], to the east and south respectively. Additionally, while six homicides were recorded in the ward of Broad Street, which is just south of the London Wall and east of Coleman Street

[15] While six homicides occurred in the Cheap ward, all were in the southern area of the ward near the main street running through the City.

Figure 3.2: Map of London with Number of Homicides recorded in the London Coroners' Rolls by Parish. The red indicates the location of the skeletal collections analysed in this study. The St Mary Spital site is off the map.



ward, the majority occurred in the south of the ward nearer the centre of the City. It also appears that few homicides occurred near any monastic sites, although it is likely that some of the perpetrators probably fled to these religious houses in search of asylum as is often recorded in the London Coroner's Rolls.

This distribution possibly suggests a lack of homicides in wealthier neighbourhoods as these wards, particularly Bassishaw and Coleman Street, incorporated the governmental centre of London and housed many wealthy barons, including the Bassing family, for which Bassishaw ward is named after, and who owed a mansion house on Basinghall Street (Noorthouck, 1773: 549-551). The parish of St Michael Bassishaw, the sole parish in Bassishaw ward, was also considered to be one of the wealthiest throughout the medieval era with many prominent merchants drawn to the area (Slack, 1985: 171; Sutton, 2005: 359).

Despite this lack of homicide in some of the richer areas of London, there does not appear to have been a higher level of violence in poorer areas. Seven[16] of the 14 poorest parishes of London identified by Slack (1985: 171) had no homicides recorded at all and three more[17] only had one homicide inquiry each. Whether this is due to a lack of homicides in these areas or a lack of recording them due to their more destitute population is unknown.

[16] All Hallows in the Wall, All Hallows Staining, St Andrew Hubbard, St Andrew by the Wardrobe, St Mary Magdalen Old Fish Street, St Mary Mounthaw, and St Mary Somerset.
[17] St Anne Aldersgate, St Ethelburga, and St Katherine Coleman.

While social status does not appear to have significantly affected the prevalence of homicide, population density and traffic might have. There was a large cluster of recorded homicides in the centre of the City, particularly in the wards of Cornhill, Walbrook, Bread Street, Cripplegate, and the west end of Langbourn. The main street through the City runs through these wards, meaning these areas are likely to have been the most populated, perhaps indicating why the most homicides occurred in these locations. This argument is strengthened by the fact that of the six homicides that occurred in Cheap ward, all were along the main street. And while Cheap was a wealthy ward of London (Slack, 1985: 171), the diverse traffic running through the area perhaps counteracted any potential disinclination for violence.

There were also seven homicides near the Tower of London, another area that, despite being relatively wealthy (Hanawalt, 1993: 34), would have seen a lot of diverse traffic as a royal residence, armoury, mint, prison, and even menagerie (Sheppard, 1998: 111). The surrounding suburbs outside the city walls also had large numbers of recorded homicides, but this is likely due to the fact that these areas covered a larger expanse of land than the wards within the walls. Their numbers also frequently included a number of people who died on their way into the city to seek medical attention after a physical attack, perhaps adding to their numbers.

Apart from the location of the homicides, another way to possibly analyse social status is by looking at the value of the perpetrator's chattels. While there are plenty of problems with using chattels as a proxy for social status, such as the

under- or overestimation of values by the jury or the fact that wealth did not necessarily equate to a higher social status, it is the only consistent measurement of wealth recorded in medieval records (Given, 1977: 68). Using these criteria, the majority of perpetrators were poor with 71.6% owning nothing at all. Only eight of the cited perpetrators would probably have been considered well off[18], owning between £1-£5, which in today's currency equates to approximately £300-£1,700[19]. Just one would have been considered wealthy with chattels worth approximately £50,000 today. While the Coroners' Rolls tell us nothing about the social status of the victims, the inquiries indicate that the perpetrators and victims were often acquaintances, and thus, most likely, from the same strata of society. Interestingly, there does not appear to have been many homicides due to lower status people attacking higher status people, whether to rob them or otherwise. There were only five instances in the London Coroners' rolls where someone was killed during a robbery, and in one of those five inquiries it was the robber who was killed.

A similar pattern was seen by Given (1977: 69) in his assessment of 13th century eyre rolls from across England. He found that the great majority of the analysed inquiries, 60.6% (1,044/1724), "had no movable property at all; 299 had some property, but worth less than 5*s*… Another 119 people had between 5 and 10*s*. worth… Indeed, only 10.6 percent of the accused had more than 15*s*. worth and could have afforded a horse". From these findings, he concluded that violence was the tool of the poor since it was the only means available to them for which

[18] The definition of "well-off" was taken from Given (1977: 68-69).

[19] According to the National Archives currency converter for the year 1320: www.nationalarchives.gov.uk/currency/results.asp#mid.

to settle disputes (ibid: 90). Despite these clear patterns, both in the London Coroners' Rolls and the eyre rolls collated by Given, it is possible, if not likely, that the wealthiest of perpetrators were able to avoid prosecution, and their crimes would, therefore, be invisible to the historical record. This highlights another gap in the historical record, which may be able to be rectified through osteological analysis.

Estimating possible changes over time is even more problematic than with approximating social status. For London, two eyre rolls exist, which cover the years 1244 and 1276. While this is an even smaller pool from which to draw data, the number of recorded homicides suggests a slightly lower prevalence than in the 14th century calculated above. Given (1977: 175) estimated that in 1244 and 1276, there were approximately eight and fifteen homicides per 100,000 respectively. However, the eyre rolls were recorded differently than the coroners' rolls and practices are likely to have changed between the 13th and 14th centuries, so how much this difference is an actual pattern and how much it reflects a recording bias is uncertain. Additionally, as there are still several years missing in between the records, how the homicide rate may have fluctuated during these years is unknown. Overall, our knowledge of how patterns of violence may have changed over the medieval period is quite poor. The court and coroners' rolls only provide evidence for the 13th and 14th centuries and other records such as personal accounts or chronicles are so varied in how they present information on violence that it is impossible to compare them to one another. So, how violence, and particularly homicide, was structured both before and after the 13th and 14th centuries remains unknown.

In terms of the weapons used for homicide, knives appear to have been the most commonly used, cited in 61.4% (86/140) of inquests from the London Coroners' Rolls (Table 3.3). Staves/sticks and swords were the next most cited weapons, mentioned in 22.9% (32/140) and 12.9% (18/140) of inquests respectively. It is not surprising that knives were used so frequently, as most medieval Londoners, including women, would have frequently carried a knife with them, which they would have used as both an eating utensil as well as a tool (Hanawalt, 1993: 75; Rimer, 2000: 122). It should be noted, that these figures only include instances of homicide. Since the lethalness of weapons may vary (for instance being stabbed by a knife may be more likely to be fatal then being hit with a staff), how these percentages compare with non-fatal violence remains uncertain. Once again, this is another gap in knowledge that may be able to be filled by the osteological record.

Table 3.3: Number of times a weapon is cited in the London Coroners' Rolls

WEAPON TYPE	# OF HOMICIDES	% OF TOTAL (N = 140)
Knife/Dagger	86	61.4%
Staff/Stick	32	22.9%
Sword	18	12.9%
Fists/Feet	9	6.4%
Axe	4	2.9%
Arrow	3	2.1%
Shovel	1	0.7%

While court and coroners' rolls can tell us statistics on violence they do little to provide us with an understanding of how medieval society perceived violence, particularly as they are written in a very stoic, clinical manner. Hagiographies and other literary accounts can help fill this gap, particularly during the 13th century when many of them were written. While the saints' lives that are

depicted in the hagiographies are from earlier periods of time, the medieval hagiographer captures contemporary themes of power structures and perceptions of violence. A common theme is the grotesque torture and ultimate slaughter of the saint by his or her angry neighbours or family because he or she refuses to renounce God. For an English audience, many of these trials and tribulations were recorded in the *South English Legendary (SEL)*, a seemingly popular text, if the number of surviving manuscripts is any indication, which was read over the course of the church's calendar year (Crachiolo, 2004: 149).

The *SEL* is seen as particularly violent compared to other contemporary vernacular legends (Tracy, 2012: 33; Winstead, 1997: 73). For instance, the account of Juliana's Life in the *SEL* is quite specific in its depiction of torture (D'Evelyn and Mill: 67):

> "Dupe wode in hure naked fleiss – þe rasors kene iwette
> Þat þo hure uless was al to torne – so deope wode & gnowe
> Þat þe bone hy to slitte – and þe marrou out drowe." (143-46)
>
> [The keen, sharpened razors penetrated deeply into her naked flesh so that then her flesh was all torn, so deeply penetrated and gnawed that they slit the bones and drew out the marrow]

The other accounts of Juliana's Life, such as the one in the Italian *Golden Legend* (De Voragine, 1969: 167), are much less detailed (Crachiolo, 2004: 150). Continually in the *SEL* we see graphic displays combined with a disassociation seen between the tortured saint and the audience (ibid: 74). This dichotomy has been argued to demonstrate that "the martyrological narratives of the *SEL*... function more as… entertainment than as didactic models of the Christian life" (Crachiolo, 2004: 151). In other words, this contention suggests that the English

may have had a unique blood lust compared to other medieval cultures, captivated as they were by the depiction of violence and gore.

Going against the entertainment argument is the fact that, unlike on the Continent, medieval English law did not condone the use of torture during instances of interrogation (Baker, 2007: 508). Tracy (2012: 134) argues that the English took great pride in their morality as evidenced by medieval English literature which links torture with "barbarian lands and corrupt authorities, or represents the systematic breakdown of civil structures". Thus, the graphic display of torture in English hagiography may not necessarily have been for purposes of entertainment, but rather as an example of why torture should be condemned (ibid: 39).

Additionally, the emphasis on discouraging the audience from identifying with the tortured saint, may not be due to an acceptance of violence as Crachiolo (2004: 151) suggests, but instead "given the highly subversive actions of virgin martyrs in these legends, it seems likely that one reason that Middle English hagiographers emphasized the saints' resilience was to distance readers from their heroines and in so doing to make it less likely that they would imitate their unruliness" (Winstead, 1997: 74). Thus, medieval English literary depictions of violence may not have been for purposes of entertainment, but rather as a moral tale of why one should abstain from violence and subversive behaviour. If this is indeed the case, excessive interpersonal violence in medieval England, while prevalent in society, may not have been as encouraged as previous authors have argued (see Chapter 1).

3.1.1.1 MEN

Men are commonly the perpetrators and victims of violence (Gottfredson and Hirschi, 1990: 45). This appears to have been as true historically as it is today. In the 14th century London Coroners' Rolls, the vast majority, or 91.4% (128/140) of all homicide inquests were instances of male-male community-based homicide. Of the 128 inquests recorded in the Rolls involving male-male homicide, 91 were cases of just one male killing another male and 26 of the cases included multiple males murdering at least one male. Additionally, while there were ten instances in which females aided and/or abetted a male assailant(s) of a homicide, there was only one instance in which a sole female assailant killed a male. In that particular case the assailant was the victim's mistress. She stabbed him with a knife during a quarrel they were having (Sharpe, 1913: 174; Context #99 in Appendices). This same pattern is seen in the 13th century eyre rolls from across England. Given (1977: 134) found that 80.5% (1,959/2,434) of all recorded victims were male and that 91.4 % (3,193/3,492) of the perpetrators were male as well.

In terms of how male-male violence was structured in medieval London, all sorts of weapons were implicated in the homicides recorded in the London Coroners' Rolls. The knife was the most heavily cited weapon, noted in 56.3% (72/128) of all inquiries in which the victim was male. Bladed weapons in general appeared to have been the weapons of choice, with a further 25 inquests mentioning weapons such as swords, axes, and daggers. The use of solely blunt force weapons appears in only 18.0% (23/128) of inquests, quite lower than the

overall prevalence (22.9%; see above), but whether this pattern would hold up when analysing non-fatal violence in unknown.

The motive for many (41.7%) of the male homicides listed in the Rolls was cited as resulting from an impromptu argument that escalated. After that the motives are about evenly distributed between a pre-existing argument, revenge for friends or family, chastisement over perceived bad behaviour (for example one man was killed for reprimanding his assailant after he almost ran over a woman and child whilst riding his horse), and as a result of seemingly random attacks. Six men were killed while either robbing a home or defending their home from a robber. In three instances the initial victims killed their assailants in self-defence. Apart from these cases involving robbery, the vast majority of inquiries seem to show that males were quick to resort to violence as a form of conflict resolution.

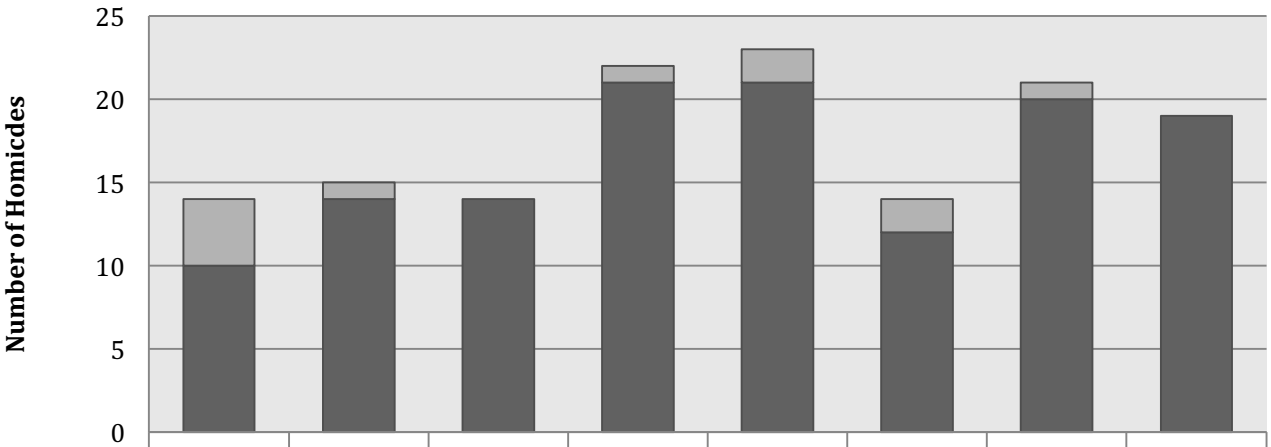
Compared to modern times, this strong preponderance for violence amongst males was perhaps particularly strong in medieval society where boys were taught how to use weapons from an early age and a strong emphasis was placed on power and masculinity (Bullough, 1994; Waller, 2000b). As Bullough (1994: 32) notes, "[medieval] males who demonstrated any feminine qualities could only be looked down upon". These ideas were cemented by the medieval importance of Christianity, a religion that emphasises the idea that men were moulded in God's image and women were moulded after men (ibid). As war and battle were the realms of men, and participation in them was the ultimate indicator of one's masculinity, the ideas of power, masculinity, and violence seem

to have been inextricably linked in the medieval period (Kaeuper, 2001: 143; Karras, 2003: 6-7, 21).

3.1.1.2 WOMEN

In medieval London, women seldom appear to have been victims of homicide. In the 14th century London Coroners' Rolls there were only 11 inquests that included a female homicide victim. All but one, which is discussed later in the domestic violence section, may be considered acts of community-based violence. Chronologically, the number of recorded female homicides is variable and does not appear to correlate with the number of male homicides in the same year (Spearman's r = -0.288, p = 0.49). The highest percentage of female homicides was recorded in the first surviving coroners' roll between 1300 and 1301 when four of the 14 homicide victims were female (Figure 3.3).

Figure 3.3: Number of Homicides recorded in the London Coroners' Rolls by Year and Sex



	1300-1301	1321-1322	1323-1324	1324-1325	1325-1326	1336-1337	1338-1339	1339-1340
Females	4	1	0	1	2	2	1	0
Males	10	14	14	21	21	12	20	19

Similar to the male homicide victims the majority of homicides against women (nine out of ten) were committed by at least one male assailant. In only one case of female homicide was the perpetrator another female acting alone. As with the males, a similar pattern was also seen in the eyre roll data. Given (1977: 134) found that 19.5% (475/2,434) of victims and only 8.6% (299/3,193) of perpetrators were women. The particularly low number of female perpetrators suggests that while in general women were unlikely to be the victims of homicide, they were even less likely to commit it.

The femicides reported in the London Coroners' Rolls were quite distinct from male victims of homicide in other ways. Six out of the ten women were struck by blunt force weapons: five were punched, kicked, or pushed and one was hit over the head by a staff. Interestingly, these included the only five inquests in which only parts of the body (i.e. fists and feet), and no other type of weapon, were used. Furthermore, two of these five women were kicked or punched in the stomach whilst they were pregnant, which in both cases caused a miscarriage of the foetus and the death of the mother.

Attacking a pregnant woman was not common in medieval England, and it was certainly not condoned. It did, however, occur often enough for cases to be brought before the royal courts, although in cases where the mother did not die, and only the foetus was aborted, there was a rather high acquittal rate (Butler, 2005). The fact that such a larger percentage of all female victims recorded in the rolls were pregnant at the time might suggest that women's homicides in general may have been underreported and might only have been more likely to be

included in the rolls if a child was also affected. This indicates that children may have been more valued in medieval London society than women.

The impetuses behind the ten instances of community-based femicide recorded in the London Coroners' Rolls were quite variable. In two of the instances the woman's death was a result of stepping into a fight between her husband and another man. In another two inquiries, the women were killed when they refused to partake in sexual intercourse with the assailant, highlighting instances of possible rape. Three women were killed after getting into arguments with the perpetrators. The cause of the argument was unknown, although in one case it is known that the perpetrator mistook the victim for another woman with whom he had had a previous argument. The last three inquests included women who were killed by perpetrators in the process of other crimes. One woman drowned when her assailant chased her into the Thames, which may have been another rape attempt. The second was killed by acquaintances because she was wearing nice clothes that they wanted to steal from her. In the last case, the woman was killed during a home invasion in which a strongbox, containing money and jewels, was stolen by the perpetrator.

Other medieval sources suggest that homicide was not the only type of community-based violence a woman might have experienced. While Londoners would have been protected by the city's walls and defences, rural properties were more vulnerable to assault, both structured and not. As men, particularly those of high status, were often away travelling for business or for their own military campaigns, maintaining the household fell on the shoulders of the

women. Margaret Paston's letters to her husband reveal to what extent women might have participated in the defending of their home whilst their husbands were away (Davis, 1971: Letter 130, 226):

> Ryt *wur*chipful hwsbond, I recomawnd me to ȝu, *and* prey ȝw to gete som cross bowis, *and* wy*n*dac*is* to bynd þe*m* wyt*h*, *and* quarrel, for ȝ*wr* hwsis her*e* ben so low þat þer*e* may non man shet*e* owt wyt*h* no long bowe pow we hadde neu*er* so moche nede. I sopose ȝe xuld haue seche thy*ngis* of Ser*e* Jon Fastolf if ȝe wold send to hym. And also I wold ȝe xuld gete ij or iij schort pelle-axis to kepe wyt*h* doris, a*n*d als many jakkys [and] ȝe may.[20]

Other accounts from Margaret, depict seemingly random attacks (as their motivations are not specified) on the Paston manor by the Duke of Suffolk and his men (Davis, 1971: Letter 196, 330):

> The Duck ys men rensackyd the church *and* bare a-way all the gode that was lefte ther*e*, both of oury*s and* of the ten*au*nt*ys, and* lefte not so moch but that they stode vppon the hey awter*e and* ransackyd the jmages *and* toke a-way such as thay might fynd, *and* put a-way the p*ar*son owte of the church tyll thay had don, *and* ransackyd eu*er*y mans hous in the town v or vj tymys.

While she herself does not appear to be harmed during any of the attacks, the possibility seems to always exist. Like the Pastons, many wealthy Londoners would have owned property both in London and in more rural estates, so at least some of the individuals represented in the collections may have experienced something similar to Margaret Paston while running their non-London properties.

In medieval hagiography, female saints are often depicted as being tortured by a group of men, usually members of their family or community (Goodman, 2015: 545; Scarry, 1985: 43). Their torture is often gender specific, focused on their

[20] Italic emphasis and letters used by Davis (1971) in his translation.

rape and, in some instances, the mutilation of their genitalia (Tracy, 2012: 39). In these hagiographies, emphasis is often placed on the female body in ways that the male body is not. This difference highlights the importance of the purity of the female body in medieval culture (ibid; Crachiolo, 2004: 147).

Women do not often bleed from their injuries in medieval literature, in stark contrast to men, who "bleed prominently…to prove valor, to avenge unjust wounds, and to impose justice" (Goodman, 2015: 552; McCracken, 2003: 10). Commonly, women's wounds also do not heal, they are forced to bear them forever, not even as heroic scars that reflect their bravery (Goodman, 2015: 551). Goodman (2015: 552-556) goes on to note that a common female injury seen in the medieval literature is the removal of the tongue, showing that her wounds not only figuratively, but also literally silenced the woman.

In all, medieval hagiography and literature clearly depicts a power imbalance between men and women in terms of violence and violent injuries. While medieval women do not appear to have actively participated in violence, and perhaps were not as affected by it as men, they were still party to it. But, for men, participating in violence was a way of asserting one's power and authority[21], while for women, who were disproportionately the passive victims of violence, it was a way of further removing it. Still, some women, such as Margaret Paston, do seem to have taken a more active role in violence, at least in terms of protecting their home and family.

[21] Although men may also have faced adversity due to their scarred bodies, at least in the early medieval period (Skinner, 2015).

3.1.1.3 CHILDREN

The idea of childhood in medieval England is a contested issue. Ariès (1960) famously argued that the medieval populace had no concept of childhood and that children were expected to act and work like adults from a young age. Others, like Hanawalt (1993) and Orme (2001), have countered this argument, positing that medieval children were lovingly cared for and that distinct stages of childhood and adolescence were recognized. Whatever the case, there was certainly a difference between childhood in England then and now. Amongst higher status individuals, children, particularly girls, could be wed at a very early age, although sexual intercourse was discouraged before puberty (Orme, 2001: 334-36). Children were also allowed a relatively large degree of freedom, able to play in the streets or fields with only the company of other children (Goldberg, 2008). Often older children, some as young as six, were given large responsibilities like caring for their younger siblings or helping their fathers with work. Were these differences reflected in the degree of violence that medieval children might have been subjected to?

The London Coroners' Rolls only record one instance of a child being the victim of homicide. In the inquest, the child, five-year-old John de Burgh, was struck over the head by Emma, wife of Richard le Latthere, for taking from her home a "parcel of wool and [placing] it in his cap" (Sharpe, 1913: 83; Context #51). Using the Coroners' Rolls as evidence, it appears that children in 14th century London were far more likely to be killed or hurt in an accident than as a result of violence. Over 18% of individuals recorded as dying from misadventure were

children, whereas they represented only 0.7% of homicide victims. Many of the children on record (41.7%) were victims of drowning or falls from windows or ladders, although two fell into vats of hot water, two were run over by a horse or wagon, and one was bitten by a sow. Reports from other sources, and from other areas of medieval England, seem to confirm the idea that child homicide was quite rare (Hanawalt, 1976: 307). But, as with all cases in which there is a lack of historical evidence, this may not mean that child homicide did not take place, rather that it was not seen as a crime, and hence not reported, or was more easily concealed (Butler, 2007). This is an area in which the osteological evidence might be able to shed some light.

Since the evidence from London is scarce, evidence from other parts of medieval England suggest that like adults, children were sometimes victims in burglary cases. But, there are few cases where a child was intentionally killed out of malice. A Northamptonshire court recorded a case where two girls, aged three and eight, were killed in their house by burglars who did not want any witnesses to their theft (Hanawalt 1979: 81). Children were also killed through excessive chastisement. While often in these cases the perpetrator was the child's parent[22], there were recorded cases, such as the one outlined in the paragraph above, where another community member took a child's disciplining into their own hands.

Burglars and chastising adults were not the only members of society accused of child abuse or murder. Sometimes the perpetrators were children themselves.

[22] This will be discussed further in the section on domestic violence.

Medieval Oxford schoolbooks tell of bullies beating other children for money. As many schoolboys were away from home, and the protection of their families, they may also have been easy targets for thieves, cut-purses, and other unsavoury sorts (Orme, 2001: 101). Children occasionally killed other children accidently while in the course of play or weapons training. In one case, a boy was accidentally stabbed by another boy's blade as they were play-wrestling (*Cal. Of Patent Rolls, 1258-66*: 345). In another case a boy, aged two, was accidentally shot with an arrow when he wandered too close to where another boy was practicing hitting a target (Hanawalt, 1979: 157). These two cases provide evidence of how not all weapons-related skeletal injuries may be indicative of intentional violence.

Abuse by a schoolmaster, clergyman, or employer was not unheard of. A London chronicle highlights a case in 1552 in which a schoolmaster beat a child so severely that the teacher was held accountable for his actions and put on the pillory (Machyn, 1848: 311). In another case, a London goldsmith had a priest arrested for excessively beating his son whilst teaching him (Hanawalt, 1993: 84). Both beatings must have been particularly brutal as schoolmasters, like parents, were expected to dole out a certain amount of corporal punishment to maintain discipline (Orme, 2001: 84, 155).

Employers were known to scold their servants and apprentices if they did not obey orders. Often this punishment could be physical. In extreme instances of abuse the apprentice was able to plead his case to the court and have his contract released. Such was the case of Thomas Bunny in Southwark, who was often made

to do harsh work outside of his apprenticeship duties and then beaten by his employer's partner if he failed in these tasks (Hanawalt 1993: 160). But, while a master or mistress was within his or her rights to use corporal punishment against an apprentice or servant to maintain discipline, excessive beatings were criticized, and sometimes prosecuted (ibid: 184).

Children were also not immune to sexual abuse. Rape was considered most grievous if the victim was a virgin, and hence many of the royal indictments recording rape involve instances of sexual assault against young women and girls (Schneebeck, 1973: 434-505, as cited in Hanawalt, 1979: 105). In one case from Bedfordshire, Walter Gargolf of Stanford, armed with a bow and arrow, attempted to throw to the ground and "deflower" a young girl, Emma. When she "raised the cry", her father, Richard Toky of Southhill, came running and Walter shot him in the head with an arrow (Hanawalt 1979: 107, as cited from *Bedfordshire Coroners' Rolls*: 27-28). Abduction and rape were also often used as a tool to secure a marriage, particularly amongst high status individuals (Hanawalt 1979: 106).

Women and girls were not the only victims of sexual abuse. Boys, particularly those going to school or working in religious houses, were susceptible to paedophilia. In the early 16th century, just before the Reformation, several cases of sexual abuse in monasteries were brought to light (Orme 2001: 104). One monk of Garendon Abbey in Leicestershire was accused of sexually assaulting at least ten boys (Strype, 1822: 396-7). While many of these cases appear shortly before the Dissolution, and may have been embellished in order to further

discredit the Catholic Church, monks appear in the historical record as child abusers as early as the 12th century (Orme, 2001: 104).

In all, medieval children risked abuse from many different members of society, including priests, schoolteachers, and even other children. But, while there are many examples of violence against children in the historical records, how many children were actually affected by violence is uncertain. The coroners' rolls suggest that it was rare, but, once again, these only highlight episodes of fatal violence and no not provide any information on non-fatal attacks. The osteological data analysed in this thesis will hopefully be able to close this gap by shedding further light on the prevalence of children's injuries in medieval London.

3.1.1.4 PRISONERS

Medieval prisoners, particularly those of lower social status, were not afforded the rights that modern prisoners have today, and the conditions of medieval prisons were particularly horrid (Bassett, 1943: 244). Vagrants, beggars, debtors, and other paupers are likely to have gone to prison merely because of their poverty (Geltner, 2008: 58-61). Since at least two of the analysed collections may include individuals of relatively low status (see Chapter 4 for more detail), it may be expected that at least some of the individuals analysed in this study may have experienced the horrors of medieval prisons.

Sixty of the inquests recorded in the London Coroners' Rolls described the death of an inmate at a London prison, most often Newgate. While the cause of death

was not often given, starvation is the main cause of death for prisoners cited in the Rolls. This is likely due to the fact that during the medieval period, a prisoner was responsible for funding his own upkeep while he was in prison and, despite the help of charity, many were unable to support themselves for the entirely of their sentence (ibid). Unfortunately, this is a cause of death, and arguably an example of structural violence, that would remain hidden from the osteological record. On the other hand, torture of the prisoners, despite being forbidden by English law (Baker, 2007: 508), was not unheard of and the evidence of which might show up in the skeletal record. In one case, during the early 14th century, Edmund le Lorimer, a jailer appointed by Edward II, was accused of locking prisoners in chains and torturing them in order to extort money (Sharpe, 1899-1912: 155). A few years later in 1326, another jailer, Hugh de Croydon, was accused of a similar crime (*Calendar of Patent Rolls, 1324-27: 347).*

3.1.2 DOMESTIC VIOLENCE

The WHO defines domestic violence as "largely between family members and intimate partners, usually, though not exclusively, taking place in the home" (Krug *et al.*, 2002: 6). Evidence of domestic violence in medieval England is rather limited and the little that does exist suggests that it was not very prevalent[23]. Hanawalt (1979: 159) found that "of all cases brought into gaol delivery only 0.7 percent were cases of one family member transgressing against another". In the vast majority of these cases (92%), the 'transgression' was homicide. Uxoricide, or wife killing, appears to be the most prevalent form of

[23] Although, once again, this may be due to the underreporting of violent behaviours that were not seen as particularly egregious.

domestic violence present in the medieval London records with filicide, killing one's child, being the next more prevalent form. Cases involving mariticide (husband-killing) or infanticide (infant-killing) were few and far between.

The divide between community and family was not as distinct in medieval society as it is today. Neighbours came together to help raise children, run households, and conduct work; the concept of the nuclear family did not exist to any great extent (Given, 1977: 43). Therefore, distinguishing between community-based and domestic violence during this time is not altogether straightforward and much of what was mentioned in the section on community-based violence applies here as well. Because of this ambiguity, husband-wife and parent-children relationships are of the main focus in this section.

Instances of spousal homicide were not prevalent in the 14th century London Coroners' Rolls. There were no inquests that recorded instances of domestic violence or homicide directed against a man and there were only three instances of what may be considered uxoricide, only one of which led to a full inquest. In the first case, the Rolls state that on the 8th of September, 1326:

> John Ryvet and Alice his wife were alarmed at midnight by a fire which had been caused by the fall of a lighted candle as they were going to sleep, and hurriedly left the burning shop; that the said John, blaming the said Alice for causing the disaster, violently pushed her back into the shop and fled, but whither, they (the jurors) know not; the said Alice was thus injured by the fire, and again leaving the shop lingered until the following Tuesday, when she had her ecclesiastical rights and died of her burns (Sharpe, 1913: 171; Context #88).

The second case was not a full inquest as there was no body. On December 6th, 1300 "William Brokkesheved fled to the church of St. Swithin de Candelwyk and

confessed that he had killed Anabil his wife, and refused to surrender" (ibid: 11). In the third case, there was a record for the death of a Hugh le Bevere, who died in Newgate prison on December 27, 1336. The Coroners' Roll states "he was confined for the death of Alice his wife, feloniously killed by him in the Ward of Candelwykstrete…" (ibid: 177-8). There is no original record for this uxoricide, although it may have been recorded in a non-surviving roll.

Outside of London, spousal homicide also appears to have been very infrequent with uxoricide once again being the most prevalent. Hanawalt (1979: 158) argued that, based on the court rolls, wife killing was very rare across the entirety of medieval England, and Butler (2001: 63), in her study of the Yorkshire coroners' rolls, found that only 52 out of 2,117 homicides, or 2.5%, were cases of spousal homicide. Additionally, of those 52 spousal homicide cases, 78.8% were instances of uxoricide. Only eleven Yorkshire homicide inquests involved a wife killing her husband and of those eleven, six of them used accomplices, five of them being male (ibid: 65). This is compared with the uxoricide cases in which 37 of the 41 cases the husband was unassisted in the murder (ibid: 64). Butler's data also shows that wives were significantly more likely to receive capital punishment for their crime than husbands, suggesting that the medieval populace perceived husband-killing as a much more egregious act than uxoricide.

While uxoricide may have been relatively uncommon, the court and coroners' rolls, either from London or elsewhere, shed little light on non-fatal spousal abuse. This may be due to the fact that non-fatal spousal abuse was not

considered a crime, or even a form of violence, in medieval English society and hence was unlikely to have been widely reported. The male head of a medieval household was responsible for the actions of his wife and children. If they disobeyed him, or committed a criminal or sinful act, he was expected to use corporal punishment to chastise them and keep them in line (Butler, 2001: 68, 71). Because of these expectations, it has been argued that wife-beating was a fairly common practice in the medieval period and might have even been considered "a normal part of marriage" (Bennett, 1987: 103; Butler, 2006a). Modern theory supports this assessment, which demonstrates that domestic violence is more prevalent in societies that condone such behaviour compared to those societies that condemn it (Levinson, 1989).

However, mere acceptance of the behaviour does not explain the inclination to beat one's wife in the first place. The question then becomes what factors are driving this particular behaviour, as it is imprudent to argue that it is natural for husbands to beat their wives or that it was inevitable that they did so. To a certain extent, the London uxoricide records answer this question by revealing the power imbalance that existed between men and women in medieval society. For instance, one inquiry suggests that perceived wrongdoing, especially on the part of the wife, may have instigated abuse or murder. In the London case highlighted above, the woman is at fault for her own abuse since she did not behave in the way expected of her by both her husband and by society. Court records from outside London show a similar story. While there are a few court inquests of a wife killing her husband over adultery, more often it is the wife who is killed because, once again, she strayed from her prescribed position in society

(Hanawalt, 1979: 165). Evidence from medieval literature comes from the love ballad "Lord Thomas and Fair Annet", in which Annet, Thomas's lover, interrupts his wedding, causing the bride to "strake Fair Annet unto the heart" (99). In response, due to his grief over the death of his lover, Thomas kills his bride and then himself:

> He drew his dagger, that was sae sharp, that was sae sharp and meet, and drave it into the nut-browne bride, that fell deid at his feit (105-108)… Now stay for me, dear Annet,' he sed/'Now stay, my dear,' he cry'd/Then strake the dagger until his heart/And fell deid by her side. (109-112).

All of this evidence shows that to many a medieval man, his wife was his possession, who's behaviour and actions he could control (Bennett, 1987: 103).

Despite the obvious lack of power for women in medieval society, there is evidence to show that the medieval population perceived a difference between appropriate chastisement and cruel, unwarranted violence. If a husband beat his wife excessively or beat her to death, he was held accountable for his actions (Butler, 2001: 72-73; Neal, 2009: 80). For instance, in the Bedfordshire Coroners' Rolls, jurors suspected the husband in the murder of his wife because they knew that he was a "chronic wife-beater" (Hanawalt, 1979: 165). In particular, if a beating led to broken bones it might have been more likely to be litigated. Neal (2009: 80) notes a case that went to trial "wherein a woman claimed a beating had broken her 'spelbon' or ulna, the bone most likely to be injured if the victim were warding off a blow to the head", an example of how parry fractures may have been a consequence of domestic violence. To avoid extreme abuse, ecclesiastical courts sometimes granted permission for a husband and wife to live separately in cases where the husband was known to excessively beat his

wife. However, despite the precaution, it was these cases of separation that seem to have escalated from abuse to murder most often. Hanawalt (1979: 165) found that in many of the reported spousal homicide cases, the husband and wife had been living apart at the time.

There is no historical evidence of infanticide occurring in medieval London. Indeed, throughout medieval England, the evidence suggests that infanticide was a rare occurrence. Hanawalt (1979: 154) only found three instances of infanticide in over 5,000 cases recorded in the coroners' and gaol delivery rolls throughout England. She also found that the mother was not accused of the murder in any of the cases in which a perpetrator was named. Using at least two eyre rolls[24] from each medieval English county, Butler (2007) found only 28 cases of infanticide. Early authors on the subject intimate that the lack of court cases and gaol deliveries dealing with infanticide is due to a medieval perception that killing an infant was not a crime or at least not a crime worth prosecuting (Kellum, 1977). Further studies have reversed this view, showing that infanticide did happen, however rarely, and perpetrators, for the most part, were prosecuted (Butler 2007; Orme 2001; 95-96).

Motives for infanticide were not often cited in the rolls, although some intention can be inferred. The most often cited case of infanticide was in Oxford in 1343 when an infant girl, half a day old, was found in the River Thames with her umbilical cord untied, meaning that the child was killed shortly after birth

[24] For the counties of Yorkshire and Essex, Butler used all records of royal indictment (coroners' rolls, eyre rolls, assize rolls, and gaol delivery rolls). In a few cases she also used the *ex officio* act books of ecclesiastical courts.

(Butler, 2007: 63; Hanawalt, 1979: 154-155; Orme 2001: 95). This case, along with several instances in which the child was found to have been killed shortly after birth, suggest that the mother did not want the baby. Whether this is due to post-partum depression, psychosis, cultural norms about single mothers, financial stress or for another reason is unknown.

Butler (2007) found that a high proportion of the accused (16 out of 19 cases with a known perpetrator) were single mothers. It might be that single mothers were more likely to commit infanticide, either due to poor circumstances or the threat of being ostracized from the community. It is also possible that single mothers were prosecuted for infanticide more often than their wedded counterparts due to prejudices against unwedded mothers. In Butler's (2007: 69) study, the only married woman to be accused of infanticide was tried in an ecclesiastic court, and thus could only be sentenced to penance and not execution. One medieval chronicle claims that during the Great Famine of 1315-1317 mothers killed and ate their children (Hanawalt 1979: 157). While a compelling image of the severity of famine during this time, this passage is most likely a case of dramatic license on the part of the author as it is the only chronicle to depict such a gruesome consequence of famine.

Male infants appear to have been more frequently killed than females (in Butler 2007 she recorded fifteen male infanticides and only three female), although often the sex of the child was not mentioned in the rolls so the data may be skewed. If this pattern holds up, however, it calls into question the idea that female children were killed more often because they were thought of as a

financial burden, particularly as they are not needed to carry on the family line. Perhaps more likely, however, it may be that killing a male child was perceived as a more egregious crime and thus, more likely to be prosecuted.

Aside from intentional infanticide there is also evidence to suggest that accidental infanticide was a problem in medieval English society. Overlaying, or accidently smothering one's child while sleeping next to the infant, was a common enough problem that the practice of sharing one's bed with an infant was actively discouraged by the church (Gordon, 1991). Additionally, parents could often end up in ecclesiastic court, or royal court in extreme cases, for the accidental death of their infant or child, if it was deemed that the accident occurred due to parental negligence (Butler 2007: 65-66). In one case from the register of the bishop of Lincoln, an infant died after the mother left him on the doorstep of the supposed father and he mistreated him while trying to foist him off on others (Butler 2007: 66).

There was no evidence of filicide, the killing of one's child, in the London Coroners' rolls, although it is unlikely that it was non-existent. In the rest of England, filicide appears in court records with more frequency than infanticide, but it still does not seem to be a common occurrence in medieval English society. Butler (2007: 71) found 96 cases involving filicide. Within those cases there were 144 child victims, which included 76 boys, 43 girls, and 25 children of unknown sex. Once again, as with the infanticides, there were a larger number of male victims than female ones. In terms of the perpetrators of filicide, mothers and fathers appeared in the court cases in similar numbers (51 fathers to 45

mothers; ibid: 71). Unlike in the instances of infanticide, there was no noticeable difference between married and single parents committing filicide.

Many of the deaths appear to have occurred while the parent was beating their child. As noted above, parents, particularly fathers, were expected to keep their children disciplined and to chastise them, often through corporal punishment, if they disobeyed (Helmholz, 1993: 24). In many of the cases where the father was accused of filicide he maintained that it was an accident that occurred in the course of castigation. In an extreme case from Yorkshire in the eyre rolls of 1279-1281, the father hung his son from a beam in order to discipline him for consorting with a thief (Butler 2007:65).

Many of the filicides in the court and coroners' rolls throughout England appear to have occurred as the result of a real accident. In these instances, the parent, often the father, was trying to do household chores like chopping firewood or slaughtering animals and was unaware that the child was so close (Butler, 2007: 72; Orme, 2001: 99-100). Why fathers are the ones most often implicated in these accidental filicides is unknown, but it may be that fathers were not as mindful of their children as the mothers were or that courts did not accuse the mothers of filicide if their child died from an accident whilst under their watch (Butler, 2007: 72).

Some forms of filicide are depicted in the rolls as occurring due to mental instability. Butler (2007: 71) found that in a third of all recorded filicides the parent was mentioned as being *non compos mentis*. Hanawalt (1979: 146-147)

found that in almost all cases in which the accused was stated as being mentally unstable at the time of the homicide, they most often killed either themselves or family members, particularly young children. It is possible that many of these cases are due to post-partum depression since many of the perpetrators were female, and the children quite young. In the Norwich delivery rolls of 1327-1329 a widowed mother killed her two sons and daughter after unsuccessfully trying to commit suicide earlier in the day (ibid: 147).

Physical abuse in the home that did not lead to death appears to have been largely ignored or rarely condemned. As stated above, a certain amount of corporal punishment was expected in order to raise a well-disciplined child and in many cases the church cautioned parents for being too lenient with punishment, rather than too harsh (Dean, 2001: 21; Hanawalt, 1986: 183; Orme, 2001: 101). Because of this, there is little evidence, apart from the homicides mentioned above, to suggest how prevalent extreme levels of child abuse in the medieval home was. However, there do not appear to be many cases of cruel child-abusing parents being brought into ecclesiastic court as was the case for extreme wife-beaters (Butler, 2007). This could mean either excessive child beating was not as thoroughly condemned as wife-beating or, more likely, it was not as common.

Domestic violence against other family members was rare in the medieval court and coroners' rolls. Fratricide, the killing of one's brother, or the physical abuse between brothers appears to be the most common form of domestic violence outside of abuse against a spouse or child. Hanawalt (1979: 160) even found that

in the manorial courts sibling violence was the most common interfamilial conflict recorded and that most of the conflict between brothers involved claims of inheritance. In particular, it appears that laws of partible inheritance, where all sons could inherit, were more contentious than laws of primogeniture, where only the oldest son could inherit. Thus, in the counties were partible inheritance was the law (i.e. Essex) there were more instances of fratricide that in counties with primogeniture (i.e. Yorkshire; ibid: 162).

There is one instance of fratricide recorded in the London Coroners' Rolls but the motive of the killing is not specified, only that the brothers quarrelled. In this case the brothers were working in the Tower of London when John, son of William de Park of Styvintone of co. Bedfordshire, and his brother Elyas began to argue. Elyas struck John with a staff intending to push him off the wall of the Tower and, in retaliation, John stabbed Elyas with a "knife called 'trenchour'". Another brother, Roger, "raised the hue and cry" (Sharpe, 1913: 103; Context #57). Despite this one incidence, in the London Coroners' Rolls it was much more common for brothers to be partners in crime rather than enemies.

3.2 COLLECTIVE VIOLENCE

The World Health Organization defines collective violence as:

> The instrumental use of violence by people who identify themselves as members of a group – whether this group is transitory or has a more permanent identity – against another group or set of individuals, in order to achieve political, economic or social objectives (Krug *et al.*, 2002; 215).

The following sections are organised based on these three motivations of collective violence. Social and economic objectives are discussed first. They are grouped together as oftentimes these two motivations result in similar forms of violence. Political violence is examined separately; in the medieval period, it is predominately characterised by warfare and government executions.

3.2.1 SOCIAL AND ECONOMIC VIOLENCE

In this section, some specific types of social and economic violence that may have affected medieval Londoners are outlined. We first look at outlaws, bandits, and highwaymen. The diverse population of medieval London would have included foreign immigrants, rural migrants, travelling merchants, and wealthy aristocrats (Sheppard, 1998: 115; Keene, 1989: 103), all of whom would have been susceptible to assaults from bandits during their travels into and out of London.

Secondly, we look at examples of xenophobic violence, which appears to have been quite common amongst the diverse populations of medieval urban centres. Early on in the period, conflicts between Jews and Gentiles were the most common form of xenophobia in London. After the Jews were evicted from England, Flemings and other immigrants from the Continent became the next target of violence. This appears to have been particularly true in the late 14th century, when English tradesmen and merchants began to accumulate more power than foreign traders. This hierarchical shift, and the consequent xenophobic-motivated violence, is highlighted by Unwin (1908: 79): "The

English capitalist was gradually replacing the foreigner…The very class of aldermen who used to be hand-in-glove with the foreigner were now ready to foster the outcry against him for their own purposes; and at their instigation a Genoese merchant was, in 1379, stabbed to the heart in front of his London lodging". This idea of solidified financial power, fomenting nationalism, and increased xenophobia is substantiated by Kumar (2003: 54-56) and Spindler (2012). To further explore this area of violence, details on the Peasant's Revolt are outlined.

3.2.1.1 OUTLAWS, BANDITS, AND HIGHWAYMEN

Robin Hood and his merry band of outlaws do not appear to have been as merry as modern depictions have suggested. The pre-1500 Robin Hood Ballads (i.e. *The Gest of Robyn Hode, Robin Hood and the Potter, Robin Hood and Guy of Gisbourne* and *Robin Hood's Death*) are rather grim and full of wrathful, not chivalrous, violence (Green, 2004). For instance, in *Gest of Robyn Hode*, our merry outlaw "…smote of the sheriffs hede, With his bright bronde" (348) while the sheriff was unarmed on the ground.

The outlaws depicted in these ballads seems to be more in keeping with the behaviour of actual medieval outlaws, who did not hesitate to injure or kill their victims (Hanawalt, 1979: 203-207). These criminal gangs were often comprised of an eclectic group of individuals, including those running from the law, peasants looking for financial gain, knights who had lost their land, and other lower members of the gentry – mainly younger sons with little to no inheritance (Bellamy, 1973: 72-73; Hanawalt, 1979: 201-202). The Coterel gang was a well-

known band of outlaws during the 14th century, who were particularly successful in recruiting members from all different backgrounds, and were also quite brutal in their attempts to steal and kill (Bellamy 1964: 716).

Whether fictional or real, outlaws, bandits and highwaymen were all of a similar breed. They frequently targeted wealthy travellers, and historical accounts report that victims were often stabbed with knives or swords, shot with arrows or beaten with fists (Hanawalt, 1979: 81-90). They did not always aim to kill, however, and were known to kidnap some and hold them for ransom as well (ibid: 206). These gangs were found with greater frequency in the more uninhabited areas in the north of England, but near London they could also be found around the king's highway in Essex and Surrey. As foreign immigrants, rural migrants, and wealthy businessmen travelled in and out of the city frequently, they would have been at risk of such attacks, the results of which might be observable in the skeletal record.

3.2.1.2 CONFLICT BETWEEN JEWS AND GENTILES

While there is some meagre evidence for the presence of a Jewish community in England before 1066, most Jews arrived soon after the Normans (Mundill, 2010: 1-4). The cause of their migration from France to England is heavily debated, but the link between the Norman invasion and the arrival of the Jews is secure (ibid: 4-5). Medieval historian, William of Malmesbury, highlights this point through his assertion in *de gestis regum Anglorum* that William I "imported" the Jews from Normandy (Hillaby, 1994: 2).

After the Norman Conquest, the Jews were placed directly under the protection of the King with him, "treat[ing] both their persons and property as his own", and using them for financial backing (Mundill, 2010: 9). Ultimately, this close link between the English Jewish community and the king caused the Jews to be seen as proxies for the Crown. Since the relationship between the king and his new subjects was rather contentious this quickly became a problematic position for them. This strife, in addition to their common role as creditor to the public, perhaps sealed their fate long before their expulsion from England in 1290 (ibid).

In particular, the Jews' role as financial backer to the both the Crown as well as the people meant that when there was any dissent between the king and his people or when there were downturns in the economy, they were often used as scapegoats. This hatred came to a head several times during the two centuries that Jews inhabited England during the Middle Ages. In London, a notable clash occurred during the coronation of Richard I on 3 September 1189, when a group of Jews came to offer gifts to the new king (Dobson, 2010:16). As they went to present the gifts, members of the Christian laity attacked them and threw them out of the hall. This incident spread, causing the citizens of London to attack Jews in the streets and burn their houses in the Jewry (Riley, 1853). As many as thirty may have been killed in the incident (Dobson, 2010: 16). Another attack occurred in 1262 during the Second Barons' War, when the Barons sacked the London Jewry, killing many Jews (Adler, 1939:26). Additionally, Jews were also frequently accused of murders, often falsely, committed near their neighbourhoods. In 1274, two Jews from Canterbury were accused of

committing murder in the parish of St Lawrence Jewry, but were acquitted (Adler, 1939:85).

These accounts of frequent clashes between Jews and Gentiles may be particularly relevant to this study, as one of the analysed collections, St Lawrence Jewry (GYE92), was in the heart of the medieval Jewry in London and the burials from the churchyard are contemporary to the presence of Jews in medieval England. It is possible that clashes might have arisen between the parishioners of St Lawrence Jewry and their Jewish neighbours.

3.2.1.3 PEASANTS' REVOLT

While it is possible that there were a number of revolts in and around London throughout the medieval period, particularly from the 14th century onwards when revolts became more commonplace (Hilton, 2003: 88, 96-97, 113), these have not been documented. The Peasants' Revolt of 1381 is one of the exceptions. While its similarity to other revolts is unknown, it is highlighted here as a possible example of the types of violence that might have been common during such unrest.

The uprising is said to have started on 30 May in Essex, after John Bampton, a member of Parliament, attempted to investigate individuals who had dodged the poll tax (Dunn, 2002). There are some accounts that unrest may have started before this incident, but it is certain that the events in Essex certainly fuelled the fire. After this incident, the uprising quickly spread across the rest of England, although the largest concentration of rebellious activity remained in the

southeast. Amongst the counties with the most activity was Kent, where a rebel army led by Wat Tyler was formed. The climax of these revolts happened on June 14 when the Kentish rebel army, after sacking Canterbury, arrived in London (ibid: 78).

Perhaps the best description of the revolt in London is found in John Gower's poem, *Vox clamantis*. While his views expressed in the poem are undoubtedly biased against Tyler and the uprising peasants, *Vox clamantis* is the only extant personal account of the uprising. Several other texts, which cover the event, such as *Historia Anglicana* (by Thomas Walsingham, a monk from St Albans), *Chronicon Henrici Knighton* (by Henry Knighton, an Augustinian canon from Leicester), and *Anonimalle Chronicle* (by a Benedictine monk from St Mary's at York), were written by individuals who were nowhere near London at the time. Although Gower was living across the Thames in Southwark at the time of the Peasants' Revolt, and thus may not have seen the revolt first-hand, he likely would have had a more direct knowledge of events then those living much further afield.

Gower's *Vox clamantis* clearly highlights the aristocratic views of those against the actions of the rebels. He describes the rebels as wild animals and blames John Ball, the priest who helped incite the riots, as someone "qui eos ad omne scelus instigabat" (who urged them to every kind of wickedness; Gower, 1850*: Cap.*^{m} *XI*). As chronicled by Gower, the violence of the revolt took on many forms, from the burning of court rolls to the killing of royal officials and tax collectors. Most of the destruction in London was directed towards government-linked

buildings such as the Savoy Palace and the Temple Inns of Court. In terms of physical encounters during the London invasion, as they did in the countryside, the rebels killed many royal officials as well as, towards the end of the revolt, slaughtered large numbers of Flemings. While the Flemings were not directly linked to the King's government they quickly became victims of xenophobic scapegoating.

Violence against the Flemings occurred throughout London during the Peasants' Revolt. The first documented event occurred in Southwark as Wat Tyler and his followers marched into London on Thursday 13 June 1381 (Dunn, 2002). Here, the Kentish rebels attacked a brothel run by Flemish women. Whether they attacked the women because they were Flemish, because they were prostitutes, because they were favoured by the mayor, William Walworth, or a combination of all of the above is unknown (Spindler 2012: 61). Other attacks were more certainly directed at Flemings because of their foreignness. On the same day as the attack on the brothel, a Holborn man killed seven Flemings at Clerkenwell. The next day one of the largest attacks took place in which the rebels decapitated at least 40 Flemings near the church of St Martin Vintry in the Vintry Ward, where the majority of the Flemish population in London lived (ibid). Spindler (2012) argues that the Flemings were not just used as a scapegoat, but that they were specifically targeted by the rebels as a way of legitimizing their goals and fomenting their sense of English identity.

3.2.2 POLITICAL VIOLENCE

The largest wealth of literature on medieval violence is focused on warfare, and subsequently is discussed first in this section. Wars, skirmishes, and revolts were common occurrences throughout the medieval period and any land-owning man would have been liable for military service. This would have precluded a large percentage of the London population, but as the London economy grew, so did the land-owning percentage of the population. Combat practice and participation in tournaments are examined in the second section. While not a form of political violence, they would have caused injuries similar to those seen during battle, and hence is important to the interpretation of violence-related injuries. In the last part of this section, forms of capital punishment are considered.

3.2.2.1 WARS

There were hundreds of wars, battles, and skirmishes throughout the medieval period and an in-depth discussion of each one and how it would have affected the population of medieval London is outside the scope of this research. However, it cannot be overlooked entirely, especially since wars were a vital aspect of medieval violence. Thus, an overview of major wars fought between 1066 and 1550 are outlined below, and how they may have affected medieval Londoners is particularly highlighted.

Excluding the frequent Viking invasions during the late 10th and early 11th century (*London and the Vikings,* 1927: 13-16; Brooke and Keir, 1975: 21-26), the first major battle London faced was after the fall of Harold at the Battle of Hastings, when William the Conqueror set his eye towards London where Edgar

the Ætheling, the next in the line after Harold, was attempting to raise a second army to fight the Normans (Stenton, 1971: 596). The two armies clashed in Southwark as William attempted to cross into London via the London Bridge (ibid). William was successfully driven back by the Saxons and he was forced to cross the Thames at Wallingford instead. From there he headed back to London and attacked from the north, where he was met by the Saxons at Berkhamstead (ibid: 597). Here, he accomplished a decisive victory that all but secured his power over the region. However, his reception into London is uncertain. Some accounts say that the City immediately surrendered, while others say that factions of the City continued to fight (ibid, Jumièges, 1914: 136). Either way, many Anglo-Saxon Londoners are likely to have participated in fighting against the Normans in some regard. After the Conquest, although unrest between Normans and Saxons continued for several decades (ex. Revolt of 1069), no rebellions were recorded in or around London.

From the 12th century onward, few wars seem to have directly affected London. During the civil unrest of the Anarchy of 1135-54, most of the fighting occurred in the West Midlands. But, when Empress Matilda made her way into London for her coronation, the citizens of the city rose up against her, causing her to flee back to Oxford (Chibnall, 1993:102-04). When Henry II's sons revolted in 1173, the defences around Montfichet's Tower were strengthened, but there is no evidence that any fighting actually took place (Stenton, 1934). The citizens of the City were often at odds with the Crown so it was not surprising that during the First Barons' War in 1216, the citizens of the City openly supported Prince Louis and, after King John fled to Winchester, he appears to have been welcomed in the

city with little to no resistance. Similar events happened during the Second Barons' War, but this time skirmishes between the citizens broke out, with the Barons located around the Guildhall sacking the London Jewry immediately to the south (Adler, 1939:26). The last time London was directly involved in a medieval battle was during the Despenser War when Lord Roger Mortimer placed the city under siege for two months in 1321 after the citizens refused to let him enter. Despite Hugh Despenser the Younger, whom the rebels despised and started the revolt over in the first place, threatening them from a ship on the Thames, no full-scale fighting appears to have occurred. However, after the siege ended, and fighting recommenced much further afield from London, many citizens of the City joined King Edward's campaign against the rebels (Weir, 2012: 135).

Although no full-scale wars occurred near London, some citizens of the City most likely participated in most, if not all of the major wars and battles throughout the centuries. During the Anglo-Saxon period military service was a free man's duty and honour, distinguishing him from the slave (Contamine, 1984: 51). After the Conquest, two-month mandatory military service for all land-owning men, continued with the reign of William I, then called a *servitium debitum* (ibid: 53). However, despite not being fully immune from conscription, Londoners possibly participated in war to a lesser extent than the rest of England. As London became more autonomous in the 12th century, the City was able to decide for itself how many soldiers it sent into the king's service (Powicke, 1962: 250). Often, they provided a much smaller number of men than requested, mainly because the City armed and paid for them (ibid). For instance, in 1314 Edward II asked for 300

archers, but the City only provided him with 120 (ibid). The City hired the troops through money raised by ward assessments and on one occasion, in 1453, the livery companies provided troops for the defence of Calais (Sharpe, 1894-1895: 279-80).

Any member of an army, whether a lowly foot soldier or a member of the knighted cavalry, was at risk of injury or death during the course of battle. While the lower status infantry probably comprised the largest percentage of battle casualties, royalty and members of the aristocracy were not immune to injury, particularly if their campaign was unsuccessful. For example, Henry Percy, after he was killed at the Battle of Shrewsbury, was disinterred and his body quartered with a different body part sent to the four corners of the Percy land holdings (London, Bristol, Chester, and Newcastle; Rose, 2002; Knüsel, 2014). In another example, the Greyfriars Research Team (2015: 70) argue that an injury to the right tenth rib and another to the right innominate bone found on the skeleton of a male hypothesised to be Richard III was received after death, possibly as a way of purposefully desecrating the body. Through this postmortem desecration, the power of the king or member of the aristocracy is symbolically broken.

3.2.2.1.1 Women and Warfare

While women were unlikely to have been on the battlefield, they could, and often were, the victims of sieges or sackings. Rape appears to have been of particular worry. The chronicle of Roger of Wendover tells the story of Abbess Ebba of Collingham, who, in 870 during a Viking invasion, cut off her nose and mutilated

her face so as to appear too horrifying to be raped (Giles, 1849: 191). Most of the emphasis on women in warfare is on their "defilement" or on the chivalrous prevention of it. As Saunders (2004: 192) highlights, during the Battle at Canes, the English commander Thomas took evasive action to prevent the raping of women by his soldiers, which appears to have been a particularly difficult task.

Whether women experienced other injuries, apart from those caused by rape, they seem to be of secondary importance and are not often mentioned (Goodman, 2015: 548-549). This may be because the depiction of rape is used as a literary tool to depict one's enemies as evil, while abstaining from such acts demonstrates one's heroism (Saunder, 2004: 195). The women's victimisation is of no importance to the chronicler. As Goodman (2015: 549) states, "Men's wounds may be glorious on the battlefield…but women's wounds in the chronicles serve as analogical verifications in that they confirm the values of a secular male hierarchy". Thus, apart from rape, the injuries women received during warfare are almost completely hidden from the historical record, highlighting another gap that analysis of the osteological record may be able to fill.

3.2.2.2. COMBAT PRACTICE AND TOURNAMENTS

From a young age, boys of high status began to practice the art of fighting. They were often sent to the household of another noble where they would begin the training of a knight, which included instruction on how to wield a sword, use a bow and arrow, and joust, amongst other fighting techniques (Waller, 2000b: 148). Horsemanship was also a necessary skill, as fighting on horseback had a

distinct advantage during combat. Fighting manuals, written by fight masters, were commonly used to help teach these combat techniques to the medieval knight (see Talhoffer, 1887; Fiore, 1902).

When there were no battles to be fought, all of this training went into tournament participation instead. Tournaments first started in England during the reign of King Stephen, sometime between 1135-1154 (Clephan, 1995:10). Participating in tournaments was a great honour reserved solely for members of the nobility and royalty. As Roger de Hoveden explained, tournaments are military exercises carried out in the spirit of comradeship that are used as practice for war and a display of one's personal prowess[25].

An informal version of the tournament appears to have taken place each year in London. As noted by William Fitzstephen (1190?; 1772: 46-48):

> Every Sunday in Lent, a noble train of young men take the field, after dinner, well mounted on horses of the best mettle, of which 'each steed's well taught to gallop in a ring'. The lay-sons of the citizens rush out of the gates in shoals, furnished with lances and shields; the younger sort with javelins pointed, but disarmed of their stell; they ape the feats of war, and act the sham-fight, practising the agonistic exercises of that kind. If the King happens to be near the city, many courtiers honour them with their presence, together with the juvenile parts of the households of the Bishops, Earls, and Barons, such as are not yet dignified with the honour of knighthood, and are desirous of trying their skill. The hope of victory excites their emulation. The generous chargers neigh and champ the bit. At length when the course begins, and the youthful combatants are divided into classes or parties, one body retreats, and another pursues without being able to come up with them; whist in another quarter, the pursuers overtake the foe, unhorse them, and pass them many a length.

[25] "*Militaria exercitia, quae nullo interveniente odio, sed pro solo exercitio, atque ostentatione virium"* in Du Cange "Glossarium" as cited in Clephan, 1995: 10.

However, despite being a source of excitement and entertainment, the sport could prove fatal. This seem to have been especially true in the earlier years of its foundation, as Clephan (1995: 11) argues:

> The tournaments of the twelfth and thirteenth centuries were characterized by all the romantic fire of knight-errantry, though they were often rough and disorderly, and not infrequently degenerated into real battles or free fights, in which many of the combatants were seriously injured or killed.

Although the sport became safer in later decades, death was still a possibility as seen by the death of Henry II of France on 30 June 1559[26]. Whilst jousting, the king was stabbed in the right eye by a splinter of wood that broke off the lance of his opponent, Gabriel Montgomery. The wound was not immediately fatal, but, nevertheless, the king died of septicaemia ten days later (Williams, 1910: 341-351). The eye appears to have been a common injury whilst jousting. Henry VIII suffered a minor injury near his eye from which he fully recovered, and Frederigo da Montefeltro, Duke of Urbino actually lost his right eye, but lived (Barrett, 1973; Santoni-Rugiu and Massei, 1982). Both injuries were also due to a splintered fragment of the jousting lance making its way through the eye slit of the visor.

3.2.2.3 EXECUTIONS

Execution was a common punishment for committing a crime in the medieval period. In London, the main execution areas were the Tower of London, reserved mainly for members of the aristocracy and esteemed citizens of the City for treason, and Tyburn tree, mainly used for the hanging of common criminals. The punishment for treason varied slightly throughout the medieval period, although

[26] An event that eventually led to the demise of the sport.

it always remained a particularly drawn out affair. Before the 14th century, individuals were hanged, but only after having suffered being dragged to the gallows behind a horse (Bellamy, 1970: 28). Edward I changed the method to disembowelling, burning the entrails, then beheading and quartering the body (Royer, 2003). In contrast, almost all common criminals were simply hanged with little pomp or circumstance (Bellamy, 170). Both types of execution are likely to have affected the bone, and thus would be identifiable in the skeletal record.

Despite their treason, high-status execution victims may have still been afforded a proper burial in London religious houses (Gilchrist and Sloane, 2005: 73). This is evidenced by historical accounts of the burial of execution victims in London, such as that of Sir Simon Burley in the Abbey of St Mary Graces and the supposed burial of Sir John Tiptoft in the church of the London Blackfriars (see Chapter 4). On the other hand, the burial of lower-status individuals varied. In some instances, the members from the religious order of St John, the Knights Hospitaller took it upon themselves to collect the bodies of executed criminals and bury them in any cemetery that would allow it (Pugh, 1981). Often, however, criminals were buried in separate cemeteries reserved for criminals (Gilchrist and Sloane, 2005: 74). In London specifically, they buried them at the Pardon Churchyard in Clerkenwell (Pugh, 1981; Gilchrist and Sloane, 2005: 73). As such, in the skeletal assemblages analysed in this thesis we may expect that high-status execution victims may be represented, but it is unlikely that low-status victims will be.

3.3 SELF-DIRECTED VIOLENCE

There is not much historical evidence of suicide, or any other type of self-directed violence, in medieval London. In the London Coroners' Rolls only three cases are recorded. The first inquest shows that on the 29th of November, 1321 Isabella, wife of Robert de Pampesworth hanged herself from a cord in the solar of her house (Sharpe, 1913: 36-37). The second record states that on July 7th, 1322 John de Irlaunde hanged himself from a beam of timber in a solar using his own shirt (ibid: 60). The last suicide recorded in the rolls was on February 2nd, 1340 when Alice, wife of Henry de Warewyk "opened the door of the house of the said Henry and Alice in the parish of St. Benedict Fynk, in the Ward of Bradestrete, and ran by herself in a wild state to the port of Douuegate and threw herself into the Thames and was drowned" (ibid: 249). If these findings can successfully be extrapolated, hanging appears to have been a common form of suicide. As it was also a common form of execution (discussed above), discerning between the two using skeletal evidence would be difficult.

It is interesting to note that in the cases of the female victims it was specified in the records that they were not of their right minds at the time of their deaths. For Isabella, the Rolls state "Isabella for the two last years and more had suffered from a disease called 'frenzy'…" (Sharpe, 1913: 37) and for Alice it mentions that for the last six months she has been "*non compos mentis*". The reason for these mentions, other than the fact that they may have legitimately been insane, is two-fold. For one, if the person was insane when they committed suicide, their heirs could still inherit their goods and property (Hanawalt, 1979: 101). Normally, if a person committed suicide, since it was considered a felony, his or her goods and

property would be seized by the Crown (Schneebeck, 1973: 269, as cited in Hanawalt, 1979: 101). Secondly, if the person was deemed to be insane they could still be given a proper burial, as suicide victims were often not allowed to be buried in consecrated ground. Instead, they were sometimes buried at crossroads with a stake placed through the victim's heart to prevent him or her from rising from the dead (Daniell, 1997: 106; Gordon and Marshall, 2000: 7). It is also for these reasons that some suicides may have been recorded as death by misadventure or even homicide instead.

Outside of London there appears to be a similar pattern to suicide. Hanawalt (1979: 101) found that suicides appeared very infrequently in the coroners' rolls, comprising only one per cent of all inquests. It does appear that there was an increase in the reporting of suicide, if not an increase in the actual act, during the Tudor period, where it accounted for 5% of all violent deaths (ibid: 102). Unlike in cases of homicide, males and females appear to have committed suicide in fairly equal numbers. The difference between the sexes is in how their individual suicides were perceived by the medieval populace. The insanity of the victim is often mentioned in inquests in which the victim was female, but only very rarely when the victim was male. Jurors seem to have thought that women were more susceptible to insanity and possession by the devil, and hence not morally culpable for their actions (Butler, 2006b).

3.4 CONCLUSIONS

The historical evidence of violence in medieval London provides a rich background of information through which to interpret the osteological evidence later on in this thesis. Men of any social background were liable to experience violence during their lifetime, either through drunken brawls at the local tavern on a Sunday or on the field of battle. While women are more likely to have encountered interpersonal violence, whether from a member of the community or her spouse, they were also victims of collective violence, as seen with the slaughtering of Flemish prostitutes during the Peasants' Revolt and the common occurrence of rape during warfare. Although men were encouraged to use corporal punishment to control their families, the evidence suggests that men were more likely to use excessive force against their wives than their children.

Overall, in terms of interpersonal violence, the historical record provides us with an idea of what the "typical" homicide may have looked like in 14th century London. The common murder was likely to have occurred between two men or a group of men on Sunday night or early Monday morning most likely along the main thoroughfares of the city. All involved parties are likely to have been drinking and the victim is most likely to have been stabbed with a knife, although they may also have been between beaten with a staff as well. How this pattern may have changed over time is, unfortunately, unknown. Evidence for non-fatal violence is lacking in the historical record (something that the osteological evidence will hopefully be able to overcome), but we might expect that a certain number of similar attacks occurred that did not result in death.

In terms of collective violence, wars, revolts, and other skirmishes appear to have been common, although, apart from the Norman Conquest, there were not many in the medieval period that seem to have directly affected London. Londoners were also affected by conscription differently than the rest of England, often being able to determine for themselves how many soldiers they provided to the King. Despite this advantage, Londoners are still likely to have participated in most, if not all, major wars and battles that the Crown fought during the medieval period.

In analysing the historical record, we are able to form a preliminary idea of how violence may have been structured in medieval London society. We are also able to elucidate areas in which the history may be biased or lacking in certain areas. For example, through examining the court and coroners' rolls we can see that women appear to mainly have been assault by strangers and that children appear to have been hardly attacked at all. But, we also know that the Church actively encouraged a certain amount of corporal punishment against one's wife and children. How frequently and how seriously women and children may have been injured by husbands, fathers, or other family members is therefore uncertain using only historical documents since they only record the most serious of cases. Supplementing in the osteological evidence can hopefully provide us with a bit more knowledge of how common domestic abuse was in medieval London, albeit with evidence of soft tissue trauma missing.

The same is true for violence between those of lower status. Historical documents are predominately made by those of higher status as they were the

ones who could read and write. Therefore, while those of lower status may be present in court and coroners' rolls, any biases that the wealthier individuals writing the rolls may have had is uncertain. Once again, the osteological record can hopefully help either support or refute the documentary evidence, which suggests that interpersonal violence was most common amongst those of lower status. In all, this chapter lays out what we currently know about violence in medieval London and provides the framework through which we can interpret the osteological evidence.

CHAPTER 4: INTRODUCTION AND BACKGROUND TO THE SKELETAL COLLECTIONS

Seven collections from six distinct sites were examined for this research from across medieval London. The collections include the three parish cemeteries of St Nicholas Shambles (GPO75), St Lawrence Jewry (GYE92), and St Benet Sherehog (ONE94), the two religious houses, Blackfriars (PIC87) and St Mary Graces (MIN86), and the two cemeteries from the medieval hospital and religious house of St Mary Spital (NRT85 and SRP98). These collections provide a diverse sample of the medieval London population and incorporate a large percentage of all medieval skeletons currently excavated from the City.

Each site is analysed separately in this chapter, with particular care given to the types of individuals likely to be interred within each. As was outlined in Chapter 2, during the discussion of the biocultural approach used in this thesis, quantitative, and even qualitative, analysis is only relevant if it is put into the appropriate context. Thus, in order to properly analyse the effects of violence on medieval London society, it is imperative to understand who exactly was buried in the cemeteries researched in this study and how they lived their lives. The burial context provides some evidence for this and is elaborated on when relevant (a summarisation can also be found in the appendix). The palaeodemography of these cemeteries also offers insight into the lives of these individuals, and is outlined in Chapter 6. But, the wider historical context must also be explored. While the historical evidence for violence was detailed in the previous chapter, here, the historical background of each site and the population

that was likely interred within it are examined. Their occupation, social status, and risk of injury are also investigated since these are factors that can particularly influence the prevalence and pattern of violence-related injuries. Some of the wider archaeological context is incorporated when relevant. For a more complete description of each collection, please see the individual site reports.

4.1 ST NICHOLAS SHAMBLES (GPO75)

St Nicholas Shambles was a medieval parish church located just north of Newgate Street, between the modern streets of King Edward Street and Saint Martin's-le-Grand in the northwest corner of the City of London. The exact foundation date for St Nicholas Shambles is unknown, but records held at St Bartholomew's Hospital state that the church was built sometime before 1187, next to an abattoir (White, 1988: 8). Archaeological evidence from both the church buildings and the cemetery suggest that the church was most likely founded sometime in the 11th century (ibid). Additionally, the original name of the church appears to have been St Nicholas Aldred (or Ealdred), possibly denoting a Saxon foundation (Brooke and Keir, 1975: 138).

The exact abattoir that is mentioned in the hospital records as being located next to the church is unknown. But, there is evidence for the presence of butcher shops, slaughterhouses, and scalding houses in King Edward Street[27], the street laying immediately to the west of the excavation site, and in Pincocke or

[27] Known as Stinking Lane until the 14th century when it was renamed Butcher Hall Lane.

Pentecost Lane (which roughly equates to modern-day St Martin's-le-Grand), the street laying immediately to the east of the site (Jones, 1976: 72). It is probably due to its location in one of the butchery areas of the City of London that St Nicholas Shambles obtained the added description to its name, the word *shambles* being an archaic term for a butcher's shop or slaughterhouse.

The church was closed and demolished sometime between 1548 and 1551. Bull Head Court was built on the site and the parish was combined with the Christ Church Greyfriars, also located on Newgate Street (Dyson, 1988). After the demolition, a charter issued by Henry VIII decreed that all of the church's endowments be given to St Bartholomew's Hospital.

4.1.1 THE PARISHIONERS

Unfortunately, the earliest surviving records from the church date from 1253, and therefore do not coincide with the burial dates of the excavated skeletons[28]. This means that there is no direct evidence of who the individuals buried in the early stages of the cemetery were. Research carried out using the wills of medieval Londoners suggests that between the years 1380-1541 anywhere from 62 to 86 per cent of will-makers requested to be buried in their local parish (Harding 1992: 122). It is likely that this number was even higher in the 11th and 12th centuries. Not only were there fewer alternative places to be buried, but this was before the idea of Purgatory, and buying your safe passage through the afterlife, become commonplace, a belief which led to an increase in burials

[28] Dated to between the 11th and 12th centuries (see Chapter 5 for more details)

within religious houses (Daniell, 1997: 12). As such, a large majority of the individuals buried in the St Nicholas Shambles cemetery are likely to be parishioners who lived and worked in the area.

If Harding's (1992: 123) findings hold true for the earlier centuries of the medieval period, a small percentage of parishioners may have chosen to be buried in the churchyard at St Paul's, particularly due to its close proximity to St Nicholas Shambles. Although, as the Normans were rebuilding the cathedral in the late 11th and early 12th centuries (Benham, 1902), it is unknown how popular the site would have been for burial in its early years of refoundation.

Work and home life were often one and the same in medieval London, and people tended to live where they worked. After the Norman Conquest, and possibly even before it, industries were beginning to cluster in certain areas of English towns (Biddle and Keene 1976: 335-6; Schofield and Vince 1994: 133). This was true of London as well. William Fitzstephen, cleric to Thomas Becket, records in his *Description of the City of London* (1190?; 1772: 32): "The followers of the several trades, the venders of various commodities, and the labourers of every kind, are daily to be found in their proper and distinct places". It is known that butchery was a trade common to the area around St Nicholas Shambles (Sabine 1933; Jones, 1976: 72), and it is therefore likely that at least some of the butchers working in and around Stinking and Pincocke Lanes (collectively known as the Shambles) would have been parishioners of the church. While other occupations may have been represented amongst St Nicholas Shambles parishioners, it is not known what they would have been.

Butchery appears to have been a long-withstanding profession in the northwest corner of London, where this site is located, although butchers were also located in Eastcheap (Jones, 1976: 71-72). There is evidence to suggest that butchery first became commonplace in this location as early as the 9th century. By the 10th century, the butchers started to form a guild, and by the 12th it is known that their hall was located in Butcher Hall Lane (formally Stinking Lane), just west of St Nicholas Shambles. Smithfield Market, a livestock market in the ward of Farringdon Within, was located nearby, and it is there where many of the butchers would have traded their products. William Fitzstephen (1772: 36) describes it as "a certain plain field, such both in reality and name: Here, every Friday, unless it should happen to be one of the more solemn festivals, there is a celebrated rendevouz [sic] of fine horses brought thither to be sold. Thither come, either to look or to buy, a great number of persons resient [sic] in the city, Earls, Barons, Knights, and a swarm of Citizens".

While some livestock were housed within the city walls (mainly pigs), most would have been located in the suburban areas outside the walls, or in farms located further afield (Keene 1989: 104-5). Before the mid-14th century, when butchery was still allowed within the city walls, the animals would have been herded from these fields, through Smithfield, and into the Shambles[29] for slaughter (Jones, 1976: 77). While the butchers in Eastcheap had the advantage of having slaughterhouses behind their shops, the butchers in the Shambles did

[29] Specifically Stinking/Butcher Hall Lane, to the west of St Nicholas Shambles

not, and therefore had to slaughter their animals in the street (ibid; Chew and Kellaway, 1973: 139-154).

The parishioners were not all male; women of course are represented in the interred population as well. Medieval women of middling status were often expected to help their husbands with their work, rear any children, maintain the household, provide the meals, and even sometimes to carry out their own work on the side, such as brewing (Jewell, 1996: 72-73, 95-97). Migrant women would most often have found work as servants in households; however, there is evidence that some women did become apprentices or had their own business (Goldberg, 1986). It should also be noted that a small number of women were known to have been butchers, as evidenced by four female butchers in the 14th century, who were prosecuted for throwing animal waste onto the street (Sabine, 1933: 339).

4.1.2 SOCIAL STATUS

The social status of the parishioners of St Nicholas Shambles is not completely certain. Butchery was a middling trade for much of the Middle Ages. Since they were traders, not merchants, they were unable to inherit from their predecessors. They, therefore, owned little land until the shift to pastoral farming in the 15th century, when butchers were able to rise in prominence, purchasing large tracts of land to raise their stock and build manors (Jones, 1976; Keene, 1989). This may be the reason that in later centuries (13th-16th) some of the parishioners of St Nicholas Shambles were wealthy enough to

purchase indulgences (White, 1988: 8). However, in earlier centuries butchers did not hold quite as high a position in society.

The butchers' status amongst other trades and crafts is contested. In the late 12th century, a prominent alderman of the City, named William Lafeite, was named the head of the butchers' guild (Jones, 1976: 2). This implies that the butchers may have had a least some level of political authority[30]. However, only one butcher was ever elected as an alderman of a ward[31]: Nicholas Crane was elected to the Aldersgate ward in 1336 (Williams, 1963; Sharpe, 1899-1912: 109, 233). Overall, the early organisation of the guild and the election of at least one alderman of the City to the head of the guild are suggestive of at least some societal status. But, compared to more prominent guilds, they were still relatively obscure on the political stage.

Despite a possible position of relative power in politics, at least in the 12th century, the butchers' economic authority does not appear to have been as elevated as other guilds. For instance, while the Goldsmiths' were required to pay forty marks to the Exchequer, the Butchers' were only required to pay one mark (Jones, 1976: 2). This difference probably reflects the two guilds disparate

[30] At this time in London, the Crown was attempting to strengthen its power over the City in light of recent citizen opposition. To achieve this, in the new City constitution c. 1190, the aldermen were given power over the individual ward governments, and were also given the power to elect a mayor.

[31] There were two different aldermen of the City: those who governed the guilds and those who governed the wards.

abilities to pay the toll[32]. Additionally, early financial records for the guild show little revenue except for fees, fines, and collections (ibid: 190).

4.1.4 RISKS

The profession of butchery would have come with its fair share of risks. Cows and pigs are large animals that can easily injure a human, either by knocking them down, kicking, or even biting them. Modern studies show that injuries from cattle are relatively common and can be quite severe (Björnstig *et al.*, 1991; Cogbill *et al.*, 1991; Jones, 1990). While there are no records to suggest how common this was in medieval London, there are records of pigs wandering into residential homes and biting children (Sharpe, 1913: 56-57). Additionally, using sharp, heavy tools to cut through tough cartilage and bone would have inevitably led to some accidents and the work would have been labour-intensive. Self-reporting among modern butchers in Nigeria suggest that the biggest hazards of the profession are knives, live cows, and bones, in that order (Omokhodion and Adebayo, 2013). A small number also reported that slippery floors and scalding water were also a problem. Other occupational health problems that were commonly cited were lower back pain, joint pain, and eye irritation (ibid).

Being able to distinguish between accidental knife injuries and intentional violent acts may pose a challenge in the analysis of the skeletal evidence. However, the location of the sharp force injury could prove useful in being able to distinguish between the two. Accidental butchery knife injuries are most likely

[32] The amount of the toll may also have depended on the number of members, and not on the guild's overall wealth.

to affect the hands and arms (Barnham and Kerby, 1981). Additionally, these accidents appear to predominately affect the soft tissue with only a few, more severe cuts potentially affecting the bone. It is also possible to fall on knives, perhaps mimicking being intentionally stabbed, but it does not appear to have been a commonly cited injury (ibid).

Knife injuries to the head may be particularly unlikely, although there is at least one clinical report of someone who accidentally stabbed herself in the face with a butcher's knife. However, neurosurgeons involved in her treatment admitted that this was "an unusual accident" (Ardebili *et al.*, 2000):

> The patient was chasing a chicken, on the snow-covered ground with a large butcher's knife in her hand. The patient slipped, lost balance on the snowy surface, and fell towards the ground. In an attempt to maintain her balance and avoid injury, the patient stretched out her hands and tried to seek support from the ground. This act directed the knife-point towards her face and the patient fell face-down towards the projecting knife blade, her face being speared with the knife blade, in was driven straight backwards through her midfacial skeleton.

It is possible that the patient's age, 90, may also have contributed to this accident. So, while accidental and self-inflicted knife injuries to the head and face are possible, they are unlikely to have been common.

Injuries from bones may be more of a threat than perceived of by butchers. In one modern study, cuts from animal bones, and not knives or other tools, were the most common injury seen amongst butchers. They accounted for 31% of all traumas and were the cause of 48% of wounds that became infected (Barnham and Kerby, 1981). Barnham and Kerby (1981) also found that wounds caused from bone, which included grazes, punctures and lacerations, were often more

traumatic and more painful than those from knives, which were mainly single slicing injuries. Similar to knife injuries, bone wounds may have particularly affected the extremities. Although the different location of injuries was not examined, the authors found that 59% of examined butchers had unhealed wounds on their hand or wrists, possibly indicating that this was the most common site of trauma. Also, similar to knife injuries, lacerations caused by bone predominately affect the soft tissue, and not the bone (ibid).

Live animals are the most likely cause of bone fracture amongst butchers and other animal handlers, either by making them fall, by kicking them, or by biting them. In modern studies, falls appear to be to the most common mechanism of injury with the upper and lower extremities being the most affected by fracture and dislocation (Mohammadzadeh *et al.*, 2013). While uncommon, skull injuries from animals appear to mainly be caused by bites, followed by kicks, falls, and trampling. One study demonstrates that they primarily affect the soft tissue, but if a fracture does occur it often affects the mandible (Zhang *et al.*, 2012). Based on these studies, most bone injuries caused by livestock are likely to appear as accidental fractures to the extremities. Additionally, it should be noted that as livestock, particularly pigs, often roamed the streets of medieval London (Sharpe, 1913: 56-57), all individuals, and not just butchers, may have been susceptible to animal-induced injuries.

Livestock injuries are perhaps most likely to be confused with possible violence-related injuries, and kicks or trampling from animals should be considered as possible differential diagnoses for large injuries to the skull and chest from the St

Nicholas Shambles site. There is one such occurrence recorded in the London Coroners' Rolls: "…on the preceding Thursday about sunrise when the above John tried to put a halter on a grey horse in the stable of Roger de Forsham the horse kicked him in the face so that he died on the following Saturday" (Sharpe, 1913: 248). While the victim was not a butcher, he was a groom in charge of horses and hence may have been at a similar risk to accidents from animals as butchers.

As the occupations of other St Nicholas Shambles parishioners are uncertain, we cannot hypothesise the types of risk that they may have faced. But, we can hypothesise general hazards that would have defined medieval London life[33]. The streets, made mostly of mud tracks[34], would have been uneven and full of potholes, perhaps making falling a common occurrence. While unlikely to be fatal, there is at least one recorded instance of an individual falling in the street and dying from his injuries (Sharpe, 1913: 199-200). The streets also provided other hazards such as being struck by a cart (two inquiries) or run over by a horse (one inquiry), incidences that were both reported in the Coroners' Rolls.

Buildings in medieval towns and cities were often multi-storeyed and could only be accessed by steep stairs and rickety ladders. As evidenced by the Coroners' Rolls, falls from these stairs and ladders proved to be quite a hazard, making up 21.2% (14/66) of all deaths by misadventure (Sharpe, 1913). Drowning, often in

[33] The below assessment of generalised injury risk in medieval London can be applied to individuals interred in every London collection.

[34] A few streets may have been paved with timbers and crushed stones as early as the 12th century, and the more major streets began to be paved with gravel and cobblestones by the 13th century (Nicholas 1997: 334). But, even with paving these streets would not have always been easily navigable.

the Thames or Fleet Rivers, also proved to be the most common accident in London during the first half of the 14th century, accounting for 36.4% (24/66) of all deaths by misadventure recorded in the rolls (ibid). However, as drowning does not affect the skeletal system, this cause of death would remain hidden from the osteological record.

While the above-mentioned accidents are more likely to have produced fracture patterns that are easily identifiable as accident-related injuries, some hazards in medieval London may have caused injury patterns that are more difficult to determine the aetiology. In the London Coroners' Rolls, there were two reports of pieces of wood falling from nearby buildings and striking (and killing) individuals below (Sharpe, 1913: 4-5, 63-64). Injuries such as these can mimic violence-related blunt force trauma and should be considered as possible differential diagnoses.

4.2 ST LAWRENCE JEWRY (GYE92)

St Lawrence Jewry was a medieval church founded sometime in the 11th century, most likely after 1050 but before the Norman Conquest, as evidenced by archaeological finds (Bowsher *et al.*, 2007: 21). The original structure was made of timber and, due to its location away from the main areas of the city, it may have originally been a small private chapel attached to an estate. Although, it is possible that it was originally a communal church created by residents north of Cheapside (ibid: 392). At its foundation, it was situated just north of Cat Street (today known as Gresham Street) and to the west of a small lane laying

perpendicular with Cat Street that possibly led to the fields behind the church, used for housing livestock. The church most likely derived its name, "Jewry", from its location just north of the medieval Jewish neighbourhood.

The site continued as a parish church throughout the medieval period. It was destroyed by the Great Fire of 1666, but was refounded (Godwin and Britton, 1839). Sir Christopher Wren designed and built the new church between 1670 and 1687 (ibid). The building remains standing today, despite suffering heavy damage during the Blitz in 1940, as a Church of England guild church just south of the Guildhall complex.

4.2.1 THE PARISHIONERS

No records survive to provide details on exactly who was buried in the churchyard of St Lawrence Jewry. However, the historical and archaeological context does provide some clues. It is known that the majority of burials date between the 11th and the early 13th century. In the 11th century, the area surrounding St Lawrence Jewry was relatively empty. A few timber buildings were discovered, particularly on the lane just to the east of the church and the excavations revealed that they were mostly domestic in nature with evidence of craftsmanship and animal stabling occurring within the same structures (Bowsher *et al.*, 2007). Pottery found among the remains of these timber structures, dating to between 1050-1140, were mainly domestic in nature but had a high degree of decoration, and a high proportion appear to have been imported, particularly from the Rhineland (ibid). While this is just one type of

evidence, it does indicate that at least some of the residents of these houses may have had a higher than average standard of living. Remains of peach and mulberry from the site, which are rare finds for early medieval London, further support this (ibid: 318).

The occupational artefacts that were found in the excavations suggest that the residents of the area around St Lawrence Jewry in the late 11th and early 12th centuries were involved in many different crafts, including shoemaking, leatherworking, and woodworking (Bowsher *et al.*, 2007). However, the craft that appears to have had the largest influence in the area, which continued throughout the medieval period, was that of metalworking (ibid). Both archaeological and documentary evidence shows that a large conglomerate of goldsmiths lived and worked in the northwest area of the City, around the Guildhall and Cripplegate (Bowsher *et al.*, 2007: 339; Keene 1996: 99). Their shops appear to have been located throughout the City, with evidence of their presence around Guildhall and in Ironmongers Lane among other places, but they mainly sold their wares in and around Cheapside and St Paul's (Baker, 1970: 174; Cherry, 1992: 11). As such, it is likely that at least some metalworkers were parishioners of the church.

By the mid-12th and early 13th century, Guildhall and the surrounding area boomed with both domestic and commercial development (Thomas, 2002). The streets and lanes around St Lawrence Jewry became densely populated. Stone buildings began to emerge on Cat Street and Basinghall Street, including many Jewish owned buildings, as this area became known as the Jewry (Bowsher *et al.*,

2007: 71). The lane to the east of the church began to be used mainly as an open-air 'cookshop', possibly for visitors to the Guildhall (ibid: 83). The archaeological evidence for increased construction reflects the dramatic rise in the City of London's population at this time. It is hypothesized that the population may have doubled during the 13th century (Barron, 2004: 238).

By the mid-13th century, the Guildhall had developed into an important political centre for the City of London. Many of the city barons, who moved into the area surrounding St Lawrence Jewry, grew to oppose the Crown as Henry III began to impose on the autonomy of London. The area around the Guildhall became filled with political tension with barons against the Crown (i.e. John fitz Geoffrey, Stephen Bukerel, etc.) living in close proximity to the English Jews. Since Jews were the direct subjects of the king, they kept the king well financed through heavy taxation, and hence were seen as enemies by the barons (Hillaby, 1992; Rubenstein, 1996)[35]. However, while affluent areas around the Guildhall certainly existed as evidenced by these well-known residents, archaeological evidence demonstrates that the majority of residents, particularly those located to the east of St Lawrence Jewry on Basinghall Street were artisans (painters, joiners, chandlers, etc.) of middling status (Bowsher *et al.*, 2007: 123).

During the late 13th century and the first half of the 14th century (1270-1350), the population of the Guildhall area specifically, and the City of London more generally, continued to grow, although at a slightly slower rate than earlier in the century (Barron 2004: 238-9). In 1290 the Jews were expelled from England and

[35] The possibility of conflict between these two groups was discussed in Chapter 3.

many of the buildings along the streets surrounding St Lawrence Jewry that were previously owned by Jews, were subdivided into smaller houses for craftsmen (Bowsher *et al.*, 2007). However, large affluent houses, often owned by leaders of the City's government, remained in the area, particularly along Aldermanbury and Basinghall Streets (ibid).

Historical evidence reveals that by the 13th and early 14th centuries mercery was a common occupation in the area, with several mercers recorded as living near the Guildhall complex on Aldermanbury Street, to the west of St Lawrence Jewry, and Basinghall Street, to the east (Bowsher *et al.*, 2007). There is also archaeological evidence to support this (Bowsher *et al.*, 2007: 137). Due to their proximity to the church it is quite possible that some mercers were parishioners of St Lawrence Jewry. However, like the goldsmiths, while they owned tenements in these locations, they sold the majority of their wares in Cheapside, a short distance to the south (Sutton, 2005: 16-18).

The Girdlers Guild, as well as several individual girdlers (whose hall was located on the nearby Basinghall Street), is known to have made significant financial contributions to St Lawrence Jewry (ibid: 139) and this may suggest that some girdlers were parishioners there. The girdlers were a craft fraternity that was also very concentrated around St Lawrence Jewry and the Guildhall. They owned several tenements on Aldermanbury Street, located to the west, Basinghall Street, to the east, and Cat Street, to the south of St Lawrence Jewry (Bowsher *et al.*, 2007: 139). Archaeological evidence from their workshops in these locations, reveal that they seem to have mainly produced buckles, strap loops, and bar

mounts (ibid: 350-351). However, because of their relatively later establishment towards the end of the 12th century it may be that, while girdlers most certainly comprised part of the St Lawrence Jewry parish, they were not represented amongst the individuals excavated at this site since no burials dating to between 1350 and 1550 were excavated (Baker, 1970: 190; Bowsher *et al.*, 2007: 19).

4.2.2 SOCIAL STATUS

The Goldsmiths were a respected craft with an established guild by 1180 (Unwin, 1908: 50). By this time, they were already fairly prominent both politically and financially. In the late 12th century they had to pay forty marks to the Crown, compared to eighteen marks owed by the pepperers and the sole mark that was owed by the butchers (ibid). By 1272, the Goldsmiths were fully established as a patrician society, and through their fraternity gained control of large tracts of land (Williams, 1963: 60; Unwin, 1908: 58). They continued to grow in prominence, and by 1327 they were one of a handful of companies granted a royal charter along with the benefit of royal patronage (Baker, 1970: 170; Cherry, 1992: 11-12). Additionally, as an old, firmly established, and tightly controlled craft, many goldsmiths were elected as aldermen of the City (Williams, 1963: 228). By the 16th century they were the second richest company in London with an average wealth of £203 (Sutton, 2005: 359).

While the individual goldsmith was likely to achieve relative success in his lifetime, his life did not necessarily begin that way. Many goldsmiths came from families of goldsmiths, but there was also an influx of migrant apprentices to the

craft (Cherry, 1992: 13). As such, they may not have benefited from an upper-middle status lifestyle in their youth and their skeletal health and fracture patterns may reflect this discrepancy. This would have been true for many other Londoners as well and should be taken into consideration during the interpretation of skeletal injuries.

The mercers were a trading guild who specialised in the importing, exporting, and selling of luxurious fabrics such as silk and linen. They were one of the earliest and one of the most prominent trading guilds in medieval London (Baker, 1970: 170). By the end of the medieval period the mercers were one of the preeminent guilds in the City of London and at the top of the Great Twelve Livery Companies. They were also one of the leading property owners compared to the other City companies (Jefferson, 2009). In 1503, they stipulated that to join the company a freeman had to have in stock a minimum of £100 worth of goods (Selby, 1881). The company was the leading exporters of fabric to the Low Countries as well as the leading importers of linen into Great Britain (Jefferson, 2009). They were also one of the largest companies in the City in terms of the number of members and apprentices. In terms of individual wealth, by the 16th century, fourteen of the forty-one men who had more than £1,000 were mercers (Sutton, 2005: 359).

The girdlers, while not one of the first guilds of the City, were firmly established by the late 12th century (Baker, 1970: 190). Despite this relatively early foundation date, they were still considered a "new" craft, meaning that they did not rise to prominence until the late 13th century (Baker, 1970: 190). Even then

they were not one of the guilds that was most dominant in medieval London society. However, along with the goldsmiths, they were one of the first crafts to be granted a royal charter in 1327 (Baker, 1970: 170). They were also one of the richer guilds involved in the process of clothes making (ibid: 172). While they were firmly a middle-status mistery, they, along with the cordwainers[36], became quite dominant in mercantilism (Unwin, 1908: 82; Williams, 1963: 227).

In all, the crafts that were most represented around the Guildhall, and hence most likely to make up the parishioners of St Lawrence Jewry, were some of the richest and most powerful companies in medieval London. It may, therefore, be convincingly argued that the individuals buried in the St Lawrence Jewry cemetery are most likely of relatively high status for London craftsmen, but are unlikely to include those of very high status, such as members of the aristocracy.

4.2.3 RISKS

Of the occupations concentrated around St Lawrence Jewry, metalworking was likely to be the most hazardous. While metalwork was a revered craft, the work was labour intensive. Goldsmiths required a large workshop with at least some ventilation to allow for the installation of a large furnace (Cherry, 1992: 24). The smelting of metals was not a risk-free activity. Working with fire, molten metal, and large, heavy instruments, including hammer and anvils, as well as sharp chisels for engraving (Cherry, 1992: 24-28), accidental injury would have been all but inevitable. Goodall (2011) provides an excellent account of the numerous

[36] A maker of new shoes, particularly of leather.

sharp, and potentially dangerous tools that metalworkers used. But, similar to butchery injuries, metalworking wounds are likely to have predominately affected the extremities (Saha *et al.*, 2007).

In one modern study, metalworkers most often injured their upper and lower limbs (Saha *et al.*, 2007). Injuries to those locations accounted for 62% of recorded wounds, while head and neck injuries accounted for 20% of accidents and only 9.1% of wounds affected the torso. Most of the recorded injuries were superficial and did not affect the bone, with only 22.8% of metalworking accidents resulting in fractures and/or dislocations. Small tools and machines caused the majority of accidents, representing 36.4% and 28.8% of incidents respectively. However, falls and stepping/striking against objects were also common causes (ibid). Interestingly, despite working with hot metals, there were very few recorded burns (4.5% of incidents). Whether this would have been true historically, when fewer safety precautions would have been enforced, is unknown.

Some of the less labour-intensive crafts may have come with less risk. Girdlers would have used tools to shape metal and leather into belts, so some injury was perhaps likely, but they did not work with molten metal or with particularly heavy tools like the goldsmiths would have. Similar to the other crafts, we might expect that upper and lower limb wounds would have been the most common type of injury, with head and chest injuries being possible, but unusual. However, there are no modern studies on such work to be able to determine definitively if this was the case.

Mercery was unlikely to have been a particularly injury-prone occupation. However, as mercers may have been required to travel quite frequently in order to build a successful trading network, they would have experienced hazards on the road and at sea. As noted in Chapter 3, the King's Highway was often plagued by highwaymen, outlaws, and bandits who preyed upon wealthy travellers, stealing their goods and sometimes harming or even killing their victims in the process (Hanawalt, 1979: 81-90). Once they successfully made it across land, traders experienced risks at sea. Piracy was a problem throughout the medieval period, but particularly during the Hundred Years' War, and often traders had to take archers and other protection with them in order to prevent their ship (and goods) from being seized (Sutton, 2005: 255). Apart from attacks by robbers, there was also the risk of falling from horses and carts or from falling from ships.

In addition to occupational hazards, several crafts are known to have participated in some of the 13th century uprisings. For instance, in 1267, shortly after the Second Barons' War, goldsmiths clashed with the tailors in an armed conflict, with both the clothworkers and the cordwainers also joining the fray. Unwin (1908: 59) states that "over five hundred were said to have been engaged, and many were wounded and some slain." In the aftermath, several of the participants were hanged (ibid). Incidents such as this should be taken into consideration when analysing the skeletal evidence.

4.3 SPITAL SQUARE (NRT85) AND ST MARY SPITAL (SRP98)

In 1197, a group of wealthy London citizens, led by Walter Brunus and his wife Roisia, founded the Augustinian priory and hospital of St Mary Spital (Stow, 1908). It appears that the earliest burials in the main churchyard predate its foundation and it has been suggested that these burials may have been part of an extramural cemetery for a distant religious house, possibly for St Paul's, as it is known that the land was owned by the Bishop of London (Connell *et al.*, 2012: 4).

The hospital quickly rose to prominence and, at its peak, became the largest hospital serving the City of London in its time (ibid: 68; Figure 4.1 shows its prominence in the city skyline). John Stow, in his *Survey of London* (1908), claims that the hospital had a total of 180 beds, making it one of the largest in the city. The priory and hospital were closed in 1539 due to the Dissolution of the Monasteries (Thomas *et al.*, 1997: 78).

Figure 4.1: WA1950.206.1-14 Antonis Van der Wyngaerde, 'Panorama of London as seen from Southwark' (1543) with the church of St Mary Spital circled. ©Ashmolean Museum, University of Oxford.



There were two separate cemeteries in the precinct of St Mary Spital: the main cemetery and the early infirmary cemetery. The main cemetery (site code: SRP98) was not originally used for hospital inmates. Instead they were buried in

a separate smaller cemetery, which was in use from 1197 to 1280 (site codes: NRT85; Thomas *et al.*, 1997: 63). After this date, the inmates were buried with the priory clergy, staff, and lay benefactors in the main cemetery (Connell *et al.*, 2012: 5).

4.3.1 THE MEDIEVAL HOSPITAL

Medieval hospitals were not equivalent to modern day ones. They were charity houses that mainly catered to the poor, particularly to those who were old, infirmed, and disabled. They also provided a place of refuge for pilgrims, rural migrants, or other travellers (Thomas *et al.*, 1997: 3). They did not specialise in the treatment of the sick, although they would have given palliative care to those who were seriously ill or dying (ibid). For minor illnesses, merely having a warm, safe place to rest and a good meal was considered appropriate treatment. Additionally, Mass and the witnessing of the Eucharist was considered important in maintaining good health and in many medieval hospitals, St Mary Spital included, the beds of the inmates were arranged so as to facilitate the view of the altar. The lay sisters would have provided the day-to-day care of the inmates, but on a few occasions, mainly in the later centuries of the hospital's existence, a physician or surgeon may have come to the hospital to attend to an ill or injured individual (Thomas *et al.*, 1997: 106-7).

The main cemetery most likely interred many of the individuals who were housed on the priory precinct. This would have included hospital inmates (or

patients)[37], the religious staff, servants, corrodians (or members of the laity who lived in tenements in the precinct), and benefactors of the priory and hospital. However, there were also a large number of mass graves located in the main cemetery (see Chapter 5), the population of which exceeds that which the priory was likely to produce (Connell *et al.*, 2012: 14). Thus, it is possible that the main cemetery of St Mary Spital buried a larger percentage of the population from across the City of London and the surrounding area than just those living within the hospital precinct (ibid).

As mentioned above, Stow (1908) claims that, at the time of the Dissolution, the hospital had up to 180 beds available for inmates. The accuracy of this observation is in question, and it is likely that Stow may have meant total number of inmates, not beds. It most certainly did not house that many inmates earlier in its foundation when the inmates' beds would have been located in the nave of the church itself (Thomas *et al.*, 1997: 103). Once a separate room for the infirmary was established in 1235, the numbers that the hospital could accommodate would likely have increased (ibid). St John's Hospital in Canterbury was of a similar size to St Mary Spital and it is known to have had approximately 60 beds (Tatton-Brown, 1984). It is likely that St Mary Spital would have had a similar number. Since 2-3 inmates usually shared one bed (Thomas *et al.*, 1997: 103), the total number of inmates that St Mary Spital could have accommodated at any one time might have been around 180, the same number mentioned by Stow.

[37] Although only after the closure of the smaller inmate hospital in 1280.

Inmates would have usually been comprised of the poor, invalids, rural migrants to the City, and other travellers such as pilgrims (Thomas *et al.*, 1997: 104). It is estimated that up to 25% of the medieval urban population lived in relative poverty (Schofield and Vince, 2003: 225). These individuals would have been comprised of native Londoners, foreign immigrants, and rural migrants to the City who were unsuccessful in finding work. Included in the poor population, would have been orphans and widows who had nowhere else to live. The invalids would have included any individual presenting with an illness or grievous injury from any origin or social status, although they were more likely to have been on the poorer end of the social hierarchy. Lepers would not have been included amongst the invalids, as there were separate sanatoriums for them, usually located in more remote areas. Pilgrims and rural migrants would have included individuals from outside of London, mainly those from the Home Counties, but also from other parts of Britain and even Europe (Thomas *et al.*, 1997: 104). Migrants may have come from any economic background, but pilgrims tended to have been of at least middling status, as it was not a cheap undertaking. The hospital also appears to have accommodated some wealthier older individuals in their retirement (ibid).

In addition to being a hospital, St Mary Spital, was also a religious house and ran quite similarly to other religious houses in medieval London (Knowles and Hadcock, 1971: 372-373). Members of the priory who lived in the precinct would have included canons, lay sisters, lay brothers, and servants. The number of canons associated with the hospital varied throughout the centuries. At the hospital's peak, in the beginning of the 14th century, there were twelve canons at

the priory, but this number dropped to six at the time of the Dissolution (ibid; McHardy, 1977). The names of some of the canons suggest that they were recruited from the priory's country properties (Thomas *et al.*, 1997: 105). Consequently, they may have been fairly educated, and most likely came from relatively well-off families in rural areas (ibid).

In 1303, there were seven lay sisters and five lay brothers on record as living at the priory (Knowles and Hadcock, 1971: 372; McHardy, 1977). However, no lay brothers are mentioned after 1344, and the number of lay sisters dropped to two by the Dissolution (ibid). The duties of both would have been to care for the sick and carry out other domestic duties, such as tending the garden. Their religious duties would have been few. They were of lower status than the canons and probably came from lower status backgrounds (Thomas *et al.*, 1997: 105).

The servants at the priory would have taken care of the overall running of the hospital, including cooking, cleaning, and maintaining the building and grounds (Thomas *et al.*, 1997: 106). Additionally, some of the corrodians may have had servants that worked solely for them. The numbers of servants working at the priory at any given time is unknown, but the names of a few have been recorded, most of which were described as yeomen (ibid).

Benefactors to the priory and hospital often requested burial within the precinct, either in the church itself or in the main churchyard. St Mary Spital benefited from the benefaction of many wealthy merchants. Several members of the Merchant Taylors' Company were amongst these numbers, and the company

enjoyed a partnership with the religious house, which included burial rights (Clode 1888: 114-15). In the 14th century the Skinners' Company founded a brotherhood of Corpus Christi at St Mary Spital (Stow, 1908: 1, 230).

While not officially benefactors, there were individuals, called corrodians, who lived in tenements located within the priory precinct usually after retiring from serving the Crown or other nobility (Gilchrist and Sloane, 2005: 64). They usually hailed from middling to upper status households, and were relatively well off financially (Thomas *et al.*1997: 105). The first corrodian was recorded at St Mary Spital in 1299 when Edward I sent his confessor's servant to live there towards the end of his service. Despite not being inmates of the hospital, they were housed, clothed, and fed using the priory's coffers, and could be a substantial financial burden (ibid). While there appears to be no direct indication that the corrodians were buried in the St Mary Spital cemeteries, they were in other religious houses (Sloane and Malcolm, 2004: 125, 185) and it might be expected that corrodians were buried at St Mary Spital as well. Gilchrist and Sloane (2005: 64) assert that "those holding full corrodies would certainly have been expected to be buried within the monastery to which they retired".

4.3.2 SOCIAL STATUS

Since the cemeteries of St Mary Spital buried everyone from paupers to wealthy benefactors, the entire range of the medieval social hierarchy may be represented amongst the interred population. However, as a hospital it may be expected that a larger number of individuals from the lower end of the status

spectrum may have passed through and thus make up a larger percentage of burials than the wealthier patrons, corrodians, and religious staff. This theory appears to be bolstered by the demographic profile of the skeletal collection, which shows that the peak age-at-death was seen amongst individuals, aged 26-35 (Chapter 5, Section 5.4), compared to an average peak age-at-death of 36-45 amongst the other combined collections. A lower peak age-at-death may be indicative of a less healthy population, which the inmates surely would have been (Connell *et al.*, 2012: 194-195; 221).

Therefore, with the possible exception of the western cemetery from St Mary Graces (discussed below in Section 3.5.1), the cemeteries from St Mary Spital are likely to have interred at least some individuals from the lowest strata in medieval London society (i.e. labourers, beggars, etc.). It is hypothesised that these individuals actually made up the majority of the city's inhabitants, but are often lost to history due to them rarely being included in documentary records (Dyer, 1989: 109, 196).

4.3.3 RISKS

The injury risk for individuals buried in the St Mary Spital cemeteries is difficult to determine due to the fact that it interred such a mixed population. As noted above many of the inmates are likely to have migrated into the city, and would have come across many risks while travelling, both accidental in terms of tripping or falling from carts or horses and intentional in the form of highwaymen and bandits (see Chapter 3). Members of the clergy and wealthy

benefactors of St Mary Spital may also have travelled for work purposes and would have been subject to similar risks. Once in London, the rich, poor, and religious alike would have experienced all the hazards of the city as mentioned above in the St Nicholas Shambles section.

Those of lower status, the inmates of the hospital, may have perhaps been most prone to injury. The London Coroners' Rolls highlight some of the risks that may have been specific to the poor. On July 3, 1322 at least 52 beggars, including women and children, were crushed to death when they rushed to the gate of the London Blackfriars seeking alms (Sharpe, 1913: 61). While crowd crushing usually causes death through asphyxiation, fractured ribs and other broken bones may also be a result (Byard *et al.*, 2006). Other modern studies show that those of lower socioeconomic status, particularly young males, are at the highest risk of injury in a population (Cubbin *et al.*, 2000). As Judd (2002) showed that this pattern also existed historically (at least in the Kerma Period of ancient Nubia), we might expect a similar phenomenon to have existed in medieval London.

The risk of injury for the other demographics that are likely represented in the skeletal population of St Mary Spital is not as straightforward. As noted above, the clergy, lay brethren, and servants of the religious house may have been migrants to the city from more rural locations. Archaeological studies of medieval injury risk for both adults and subadults, suggest that fractures to the extremities are more common amongst those from rural areas (Judd and Roberts, 1999; Lewis, 2016). Additionally, once in London, the monasteries could

be as hazardous as the rest of the city. Servants, and even monks, often undertook any necessary construction themselves and falls from scaffolding, roofs, ladders and towers appear to have been common (Kerr, 2008).

Piety does not seem to have prevented violence either. Perhaps the most famous case of religious violence is the assassination of Thomas Becket, the archbishop of Canterbury, on 29 December 1170 in the Canterbury Cathedral. He was murdered by knights sent by King Henry II after the archbishop excommunicated members of the English clergy for crowning Henry's son without official permission (Barlow, 1986). However, the clergy were not only the victims of homicide, they seem to have sometimes been the perpetrators as well, although it appears that they preferred poison over physical assault (Kerr, 2008).

4.4 BLACKFRIARS (PIC87)

The Blackfriars of London was first founded in 1221 at a site just south of Holborn. However, in 1275 the Archbishop of Canterbury, Robert Kilwardby, who himself was a Dominican, secured a site on Ludgate Hill, where the old Norman fortress of Montfichet's Tower was in ruins (Johns, 1989: 60, as cited by Watson, 1990: 25). The construction of the church started soon after, most likely on or before 1279 (Clapham, 1912: 58). Edward I granted permission for the city walls to be demolished between Ludgate Hill and the Thames, and rebuilt further west in order for the friary to have a larger precinct (ibid).

Early on in its existence, the friars enjoyed a close link with the Crown, even involving themselves in judicial affairs. Edward I was the principal patron at its

foundation and donated a large sum of money for its endowment, including all of the deodands[38] he received from 1278-1280 (*Calendar of Patent Rolls*, 1272–81: 252). London Blackfriars continued to benefit with the succession of Edward II, who appears to have often resided in the priory (Sharpe, 1899-1912: 17). Overall, with the help of this royal backing, the Blackfriars became the wealthiest and most powerful religious order in London.

However, with this royal link came its disadvantages. Neither Edward was well liked by the citizens of London, and this sentiment extended to the priory. The antipathy was so strong that at the death of Edward II, the friars fled the city (Page, 1909: 498-502). After a few decades of turmoil, the friary re-emerged in prominence by 1350, this time with the favour of the London populace. While Edward II's successor, Richard II, still favoured the priory, granting them certain tax exemptions (*Calendar of Patent Rolls*, 1391–6: 379), the friars learned not to meddle in political affairs, and so remained removed from the controversy of Richard II's fall and the rise of the House of Lancaster. Over the next two decades, a large number of citizens chose to be buried in the London Blackfriars church and churchyard. In particular, the priory was favoured by several guilds and fraternities, specifically that of the cordwainers (Palmer, 1891: 124-125).

4.4.1 THE FRIARS

The Dominicans were not known as the humblest of Mendicant Orders in medieval England. They mainly recruited members from the upper echelons of

[38] Money or objects forfeited to the King because they contributed to the death of an individual.

society, and were often highly educated, highlighted by the fact that the first Dominican friary established in England was at Oxford (Hinnebusch, 1951: 4). The London friary was fairly large with 90 friars in 1305. However, as with most friaries, their numbers declined over time, with 64 to 80 friars recorded in 1316 and only 34 recorded in 1466 (Knowles and Hadcock, 1971: 217). Still, compared to some friaries, which completely collapsed after the Black Death, these numbers suggest London Blackfriars remained fairly strong until the Dissolution (ibid: 212).

Both the extra- and intramural burials would have included ecclesiastic members of the friary, but historical records indicate that their burials were geographically separate from the lay population (Watson, 1990: 62). If this is correct, the area for friar burials would have primarily interred males. As all of the burials recovered from the churchyard had a relatively equal sex ratio (see Chapter 5, Section 5.5), this may indicate that a lay population was primarily buried in the excavated area and that few, if any, friars are represented amongst these individuals.

4.4.2 THE BENEFACTORS

As for the lay population, records indicate that the churchyard was often favoured as a burial location by London-based merchants and tradesmen (Palmer, 1891: 124-125). Out of 209 records for burial requests in the London Blackfriars, 76 were from known members of the London Livery companies,

almost half of which were members of the Great Twelve[39] (ibid). The intramural burials from the church, cloisters, and St Anne's chapel are also known to have interred rich benefactors of the friary (Clapham, 1912: 82-83; Palmer, 1891a; Palmer, 1891b). More specifically, there appears to have been a shift in the types of people requesting burials in the London Blackfriars over the course of its tenure. During the 14th and early 15th century, the majority of requests came from citizens of the city who were members of various livery companies (Palmer, 1891a; Palmer, 1891b). By the late 15th and early 16th century the burial requests were instead increasingly made from members of the aristocracy, including knights, esquires, gentlemen, and their wives. The few merchants that continued to make requests almost all came from the Great Twelve Livery companies (ibid).

It is possible that the 1st Earl of Worcester, Sir John Tiptoft, was buried in London Blackfriars, despite being beheaded at the Tower of London by the Lancastrians in 1470 for his support of Edward IV (Palmer, 1891a: 30). In his sister's (Joan Ingaldesthrope) burial request it states that she wanted "her stinking and corrupt body to be buried in the Chapel of our Lady, set within the church, in the same place where the body of Sir John Tiptoft, late Earl of Worcester, her brother, rests" (ibid).

[39] The Great Twelve livery companies were (and are) the highest-ranking in terms of economic and political power. These companies are: mercers, grocers, drapers, fishmongers, goldsmiths, skinners, tailors, haberdashers, salters, ironmongers, vintners, and clothworkers.

4.4.3 SOCIAL STATUS

Thus, those interred in the church and churchyard of London Blackfriars represent a fairly mixed population, from members of the clergy, to London merchants, to those of low peerage. However, one thing that they do seem to have in common, is that they were all of relatively high status. Most of the London citizens that requested burial in London Blackfriars appear to have been relatively well-off members of the most prominent guilds, and many aristocrats who were buried here also appear to have made donations to the friary (Clapham, 1912: 82-83). It is likely that those of lower to middling status are not represented amongst the excavated individuals in any great number, and may have only been buried here as a form of charity.

4.4.4 RISKS

Many of the individuals buried in the London Blackfriars are likely to have experienced similar risks to those buried in St Lawrence Jewry as both likely interred relatively wealthy merchants and tradesmen of similar occupations. However, there is also likely to be a sizeable aristocratic population represented amongst the Blackfriars burials that was not present in the St Lawrence Jewry cemetery. As mentioned in the St Mary Spital section, both wealthy merchants, for trading purposes, and members of the aristocracy, to visit their different estates, are likely to have travelled in and out of London frequently. This would have predisposed them to attacks by highwaymen or by accidents relating to falling from horses or carriages. Additionally, the aristocratic males from

Blackfriars included a small number of knights, who may have suffered from injuries during combat or combat practice.

4.5 ST MARY GRACES (MIN86)

King Edward III founded the St Mary Graces abbey in 1350 on top of the East Smithfield Black Death cemetery, directly to the east of the Tower of London outside the city walls. Edward may have chosen to found a Cistercian abbey in London, despite them normally being established in rural locations, as a way to uphold a long family tradition (ibid: 16). The location may also have been chosen in part as a memorial for the Black Death cemetery founded there in 1348 (Grainger and Phillpotts, 2011).

Its royal foundation is not the only testament to the abbey's power and affluence: decorative tiles, stoves, and other archaeological finds, many of which were imported, attest to the great wealth the monastery enjoyed (Blackmore *et al.*, 2011; Gaimster, 2003: 125; Gaimster *et al.*, 1990). The abbey appears to have also been the second richest Cistercian abbey in England, after Fountains Abbey in West Yorkshire, with a net income of £547 (Knowles and Hadcock, 1971: 112-115). The abbey closed during the Dissolution and was converted into a manor house for Sir Arthur Darcy in 1542 (ibid: 2, 56-58).

4.5.1 WESTERN CEMETERY: Victims of the Black Death

There were three distinct burial locations in the St Mary Graces precinct: the western cemetery, the abbey churchyard, and intramural burials within the

abbey buildings. Not much is known about those who were buried in the western cemetery. Due to its location on top of the previous Black Death cemetery, and its similar demographic profile, it is possible that this burial site may have continued to be used for victims of the later waves of the Black Death and other epidemics (Grainger and Phillpotts, 2011: 33, 98). Llewellyn Smith (1939) suggests that plague victims from nearby Stepney, which was heavily affected by the Black Death, were buried at East Smithfield. But Grainger *et al.* (2008) dismiss this idea as the number of burials from both the East and West Smithfield plague cemeteries suggests that they accommodated a larger per cent of London Black Death victims, although the exact figure is uncertain.
These individuals buried in the western cemetery would have lived through the first devastating wave of the Black Death, only to be killed in its subsequent, smaller waves after already having witnessed the decimation of the population.

Both the site report from the East Smithfield Black Death cemetery and from St Mary Graces suggest that the epidemic cemeteries most likely interred individuals from the lower strata of society, but neither cite the reason for this assumption (Grainger *et al*., 2008: 23; Grainger and Phillpotts 2011: 98). They might be assuming not only that poorer individuals would have suffered higher mortality than their richer counterparts, but also that richer individuals would still have been buried in parishes or religious houses. It is certainly known that the East Smithfield cemetery was originally commissioned a month after the Black Death reached London, to help the parish churches and hospitals cope with the large influx of burials (Hawkins, 1990). It is also known that many of the wealthier inhabitants of London fled to rural estates (Horrox, 1994). Based on

this evidence, it is reasonable to assume that the majority of individuals buried in the western cemetery were of a middling to low status, and certainly of lower status than the burials from the abbey buildings and churchyard, which interred those of very high status (see below sections).

4.5.2 ABBEY CHURCHYARD: Clergy, Servants, and Benefactors

The abbey churchyard was most likely comprised of a mixture of religious and lay burials. Monks and other members of the St Mary Graces' clergy are likely to have been buried here as well as servants, officers, and other laity that worked for the abbey (Grainger and Phillpotts, 2011: 98). Overall, in terms of numbers, the abbey was quite small. Normally a new Cistercian abbey was required to have at least thirteen monks, including an abbot, and ten lay-brothers (Knowles and Hadcock, 1971: 110). However, special dispensation was given to St Mary Graces and it was founded with only six monks instead. Numbers did not grow much over its tenure with only eight monks recorded in 1381 and nine at the time of the Dissolution (ibid: 121).

No lay-brothers are mentioned in the records for the abbey and this may be due to the fact that after the Black Death (Knowles and Hadcock, 1971: 121), lay-brotherhood disappeared as a practice as they were drawn into other occupations by higher wages brought about by the decimation of the population (Platt, 1969: 94-95). However, there were a number of recorded servants, with ten listed in the accounts from 1391. These numbers did decrease over time with

six listed in 1425 and only two at the time of the Dissolution (Grainger and Phillpotts, 2011: 94-95).

Benefactors to the monastery who did not favour, or were unable to afford, intramural burials might also have chosen to be buried in the churchyard. Documentary evidence reveals the names of two men who requested burial in the churchyard of St Mary Graces: John Galeys, who's will was recorded in 1358, and John Shirbourne, who's will was recorded in 1375 (Sharpe, 1889-1890: 160, 182). Unfortunately, not much is known about either individual. Lay residents of the abbey, called corrodians, may also have chosen to be buried in the churchyard since this was a common practice in other religious houses (one residency was even located on the boundaries of the cemetery; Gilchrist and Sloane, 2005: 64; Grainger and Phillpotts, 2011: 98; Sloane and Malcolm, 2004: 125, 185).

4.5.3 ABBEY CHURCH AND CLOISTERS: Clergy and Benefactors

Much is known about the intramural burials of St Mary Graces. The individuals interred within the abbey walls were most likely a mixture of important clergy and patrons, who were able to afford intramural burial. The 'Visitations of Clarenceux' lists several of the buried laity by name and indicates that many of the important patrons were buried in the presbytery and the chapels east of the rood screen (Wagner, 1956:143-4). The majority of names listed are of wealthy lords, knights, and their families. The document is biased, however, as Thomas Benolt, Clarenceux King of Arms at the time of the visitation to St Mary Graces,

was more concerned with checking the authenticity of heraldic titles on the monuments in the abbey, which would not include the burials of individuals who did not have or could not afford monuments for their burials (Grainger and Phillpotts, 2011: 106). Additionally, the location of a monument does not necessarily indicate the location where the body was buried; so, using the documentary evidence to identify individual skeletons is problematic.

Due to its royal foundations, the abbey, particularly in its earliest decades, profited from a large number of wealthy, aristocratic benefactors. After Edward III's death in 1377, his successor Richard II maintained a close link with St Mary Graces, and in the 1390s he attempted to bestow more land upon the abbey, mainly comprising the leper hospital of St Giles in the Fields and its surrounding property (*Calendar of Patent Rolls*, 1396-9: 47-8). Besides donations, much of the abbey's wealth came through the purchasing of obits and chantries[40] by members of the royal family as well as by other wealthy patrons. St Mary Graces carried out obits for such royalty as Queen Isabella, Queen Philippa, and Henry IV. Edward III also purchased obits for his friend and advisor Sir Simon Burley, who was executed by the Merciless Parliament in 1388 and was buried in the presbytery near the high altar. Lower members of the aristocracy and wealthy merchants were also closely linked with St Mary Graces. Sir Nicholas Loveynes, ambassador to the Holy See in 1361 and lord of East Smithfield, and Sir Lewis John, a goldsmith and a member of Henry V's court, both purchased obits for St Mary Graces. As with St Mary Spital, members of the Merchant Taylors' Company, one of the most prominent guilds in medieval London, also had a

[40] Remembrance masses paid for by the deceased.

partnership agreement, which included burial rights, with 'Our Lady North of the Tower', most likely meaning St Mary Graces (Clode 1888: 114-15).

Less is known about the intramural ecclesiastic burials as only one abbot, Richard Pest (or possibly Prehest), is known to have died while in office (Grainger and Phillpotts, 2011: 105). However, the sex distribution of the church burials 2.6:1, similar to the abbey churchyard, suggests that an ecclesiastical population did not exist to any large extent within this population. It is possible that some of the monks of St Mary Graces were buried to the east of the rood screen. There were a large number of burials in this location, but very few of them were mentioned in the 'Visitations of Clarenceux', suggesting that either they represented the laity who could not afford or did not want large monuments for their tombs, or the ecclesiastical members of the abbey were buried here.

4.5.4 RISKS

As mentioned above, other than the fact that they were victims of the Black Death and likely to be of middling to low status, little is known about the individuals buried in the western cemetery. Thus, being table to determine specifics risks they may have faced is impossible. However, the population is likely to include rural migrants, since they accounted for such a large percentage of the London population (Sheppard, 1998: 115), who would have travelled and faced the hazards of the road. They also would have experienced all the risks that came with living within the bustling urban centre of London (see section on St

Nicholas Shambles). Due to their lower social status, they may have participated in more labour-intensive occupations; so, we may expect a relatively high fracture frequency amongst them, particularly in the vertebrae, ribs, and extremities, which seem to be a common fracture distribution amongst urban individuals from the medieval periods (Lewis, 2016).

As for the individuals buried within the abbey precinct, this population was predominately comprised of religious clergy, wealthy aristocrats, and a few servants. The religious clergy and servants were not immune to injury, either accidental or intentional and are likely to have experienced a similar level of risk to the religious populations interred at St Mary Spital and London Blackfriars (discussed above). The wealthy laity in St Mary Graces were probably similar to the aristocrats buried in the London Blackfriars and may have experienced a similar level of risk to them. In particular, as noted above, a large number of knights are known to have been buried in the church of St Mary Graces. As such, it may be expected that they participated in tournaments or other types of combat practices, and maybe even combat itself. Highlighted in Chapter 3, tournaments could be quite dangerous activities, sometimes resulting in life-threatening injuries. Although the exact fracture pattern of such activity is uncertain, facial injuries are known to have been common (Chapter 3).

4.6 ST BENET SHEREHOG (ONE94)

The exact foundation date for the medieval parish of St Benet Sherehog is uncertain. Documentary evidence reveals that the church certainly existed by the

early 12th century, as it is mentioned in a list of the London properties owned by the Canterbury Cathedral Priory around 1100 (Kissan 1938-40: 57), but archaeological evidence suggests a slightly earlier date c.1050 (Burch *et al.*, 2011: 245-6). Taken together, the church was most likely established sometime towards the end of the 11th century, after the Norman Conquest. As the church abutted a rather large property, it is possible that the church originated as a private chapel for this estate, as was the case for many early medieval parish churches, including St Lawrence Jewry mentioned above (Miles and White, 2008). The name "Sherehog" most likely derives from a priest of the parish named Alfwinus Scerehog, who witnessed a gift to St Paul's Cathedral sometime between 1107 and 1138 (Burch *et al.*, 2011: 248). The church was destroyed in the Great Fire of 1666 and was not rebuilt, although the churchyard continued to be used for burials until the 19th century (ibid).

4.6.1 THE PARISHIONERS

St Benet Sherehog was located in the heart of the merchant area of the City in Cheapside. The area was prime real estate, and as such, the parishioners of St Benet Sherehog were most likely high-status merchants. The historical record appears to support this assessment. John Stow in his *Survey of London* provides a, not entirely accurate, list of people buried in St Benet Sherehog (Burch *et al.*, 2011: 255). His list includes several mercers and grocers as well as a handful of aldermen and at least three mayors of the City. Additionally, the will of the wealthy draper, William Holbech, states his wish to be buried in the church of St Benet (Sharpe, 1894-1895: 103-104).

While many of the parishioners may have been migrants from other areas of England, as they made up a large portion of the population during the late Middle Ages (Sheppard, 1998: 115), wealthy immigrants from the Continent also appear to have been parishioners of St Benet Sherehog. From the mid-13th century onward, the largest alien group consisted of Italian merchants from Lucca, Italy (Dempsey, 1993). They predominately lived in the streets just south of St Benet Sherehog (Burch *et al.*, 2011: 257), and were so numerous in the area that they established the cult of St Zita of Lucca, who was the patron saint of domestic servants and housekeepers (Benvenuti Papi 1990: 122-3, 263-303). As such, the cult was particularly attractive to women. The cult became so popular in the area that the church of St Benet Sherehog became known, colloquially, as the church of St Sithe, and the road running perpendicularly south of the church was named Sithe Lane. There also appears to have been some Dutch and French immigrants amongst the parishioners as well (Miles and White, 2008: 9; Dale, 1931: 41).

4.6.2 SOCIAL STATUS

Despite it being one of the smallest parishes in medieval London, St Benet Sherehog was also one of the wealthiest (Slack, 1985: 157, 171). Located in the wards of Cheapside and Cordwainers, the parish was right in the midst of the merchant area of the medieval City of London. By the late Middle Ages, as noted by Stow (1908), the street north of St Benet Sherehog, Bucklersbury Street, was occupied almost entirely by grocers and apothecaries, whose trades frequently intertwined. In 18 out of 32 wills (56%) recorded in the parish of St Benet

Sherehog, the male testator was a grocer. Only one person each represented all other occupations; they were either employed in well-off trades or were lower members of the gentry, specifically gentlemen and esquires. The Grocers Guild was one of the richest and most powerful of the medieval London guilds, and it continues to be at the top of the Great Twelve Livery companies today. In demonstration of their collective wealth, in 1480, in order to join the company, one had to have a stock of goods worth at least £40 (Thrupp, 1989). Mercery was another profession that was well represented in the area, with the richest of the mercers concentrated in wards of Cheap, Cordwainer, Cripplegate, Coleman Street, and Bassishaw (Sutton, 2005: 359).

The wealth of the St Benet Sherehog parishioners was not only evidenced by their trade, but also by where their wills were recorded. Sixty-eight per cent of wills made from 1450-1570 were proved in the Prerogative Court of Canterbury, which was predominately used by people who owned property in more than two dioceses. Only 11% proved their wills in the London Commissary Court. For comparison, between 1450 and 1570, the poorer parish of St Andrew Hubbard had 75% of their parishioners prove their wills in the London Commissary Court and only 23% proved in the Prerogative Court of Canterbury (Burgess, 2002: 40-1).

While there may have been poor members of St Benet Sherehog, at least by the 16th century the wealth of the other parishioners was apparently able to support them. The parish was listed as one of 70 parishes required to provide money to

support the poor in other parishes, indicating that they were able to help fund their own poor and then some (Burgess, 2002: 54).

4.6.3 RISKS

As parishioners were predominately comprised of mercers, grocers, apothecaries, and other tradesmen they probably faced a similar risk of injury as highlighted in the sections on St Lawrence Jewry and the London Blackfriars. As these professions did not often require the use of any heavy or dangerous tools, they are unlikely to have experienced many occupational hazards. However, all of these occupations often required extensive travelling, mainly to facilitate trade routes and importing/exporting partnerships (Sutton, 2005: 255). As has been highlighted throughout this chapter, travel was a dangerous actively in the Middle Ages, and many of the parishioners of St Benet Sherehog would have been at risk. Women and children were also not immune. Despite not having to travel for work purposes, as many of the parishioners of St Benet Sherehog seem to have owned multiple properties (see above) and many of the wealthier London families had rural estates (Horrox, 1994), it is likely that their families would have moved between the multiple houses.

As with all individuals living within medieval London, they would have experienced all of the risks inherent to city life. In particular, as highlighted in Chapter 3, many of the homicides recorded in the London Coroners' Rolls occurred along the main thoroughfares of the city. As St Benet Sherehog was located near one of the main crossroads of the City, it may be expected that those

in the church's surrounding district may have been party to or witnessed at least one homicide.

4.7 CONCLUSIONS

These six different sites in medieval London represent a large and diverse sample of the population that spanned in time from the 11th century to the middle of the 16th century. From poor invalids and middling-status butchers to rich lords and ladies, individuals from every economic tier are represented. Some individuals would have been born and raised in London, knowing little else of the world around them. Others would have migrated to the city from more rural parts of England, or even from the Continent, and their early life experiences might have been strikingly different from "local" Londoners. Table 4.1 provides a brief overview of how the demography of the populations interred within each collection may have varied.

Table 4.1: Summarisation of the demography of each skeletal collection

COLLECTION	CEMETERY TYPE	OCCUPATIONS	SOCIAL STATUS
St Nicholas Shambles	Lay	Primarily Butchers	Middling
St Lawrence Jewry	Lay	Craftsmen/traders, including goldsmiths and mercers	Middling to high
St Mary Spital	Monastic hospital	Poor inmates, religious clergy/staff, and wealthy benefactors	All
London Blackfriars	Monastic	Wealthy craftsmen and lower member of the aristocracy	High/aristocratic
St Mary Graces (Western cemetery)	Lay	Members of London society	Low/middling
St Mary Graces (Abbey precinct)	Monastic	Religious clergy/staff, and members of the aristocracy	High/aristocratic
St Benet Sherehog	Lay	Wealthy craftsmen/traders including mercers and grocers	Middling to High

Overall, the diversity of the collections allows for a comprehensive analysis of violence in post-Conquest medieval London, particularly in terms of sex, social

status, and time period. But, the complex heterogeneity of the collections will prove difficult to account for in terms of analysing trauma patterns. In general, we may expect that many of the individuals from all collections would have travelled either as rural migrants, as wealthy tradesmen, or as aristocrats. We would also expect that city living would have a generalised risk, such as uneven roads, multi-storeyed buildings, and large crowds, which would have affected all Londoners equally. But, each collection may also have its own unique risk. Perhaps the most easily identified are the butchers from the St Nicholas Shambles collections, who may have experienced risks from working closely with knives and large animals.

CHAPTER 5: MATERIALS AND METHODS

This chapter is broken up into two main sections: the *skeletal material* and the *methods* used to analyse them. The first part of the chapter very briefly summarises the different skeletal collections analysed in this thesis. For more information on each site, such as the location of the site, excavation details, and the pertinent archaeological and burial context please see the appendix.

The second part of this chapter outlines the methods implemented during the data recording for this research. The standards used to determine bone and skeletal completeness, as well as sex and age are outlined first. It also presents the diagnostic criteria for different types of trauma, including other information pertinent to the interpretation of bone fractures such as the degree of healing, healing complications, and differential diagnoses. The justification for the inclusion of certain types of trauma as being caused by violence and how it was assessed are also provided. When and how certain statistical tests were used is highlighted at the end of the section.

5.1 MATERIALS

Data from seven skeletal collections were analysed in the course of this research. The Centre for Human Bioarchaeology at the Museum of London curates all the skeletal material. The author personally collected data from six of the collections from September 2012 to July 2013. The raw data from the seventh collection, St

Mary Spital (SRP98), was given to the author with the permission of Museum of London Archaeology. A list of the collections can be found in Table 5.1.

Table 5.1: List of Collections

COLLECTION	TIME PERIOD	CEMETERY TYPE	# OF SKELETONS
St Nicholas Shambles (GPO75)	1000-1200	Lay	218
St Lawrence Jewry (GYE92)	1050-1140	Lay	16
	1140-1230		41
	1270-1350		1
	1550-1666		2
Spital Square (NRT85)	1197-1280	Monastic	48
St Mary Spital (SRP98)	1120-1200	Monastic	510
	1200-1250		1398
	1250-1400		2842
	1400-1549		650
Blackfriars (PIC87)	1200-1538	Monastic	56
St Mary Graces (MIN86)	1350-1400	Lay	187
	1353-1388	Monastic	2
	1353-1400		10
	1353-1538		77
	1400-1538		83
	1424-1538		2
St Benet Sherehog (ONE94)	1250-1500	Lay	8
	1280-1666		13

5.2 METHODS

The recording of all data used in this research was carried out between September 2012 and July 2013 at the Centre for Human Bioarchaeology at the Museum of London. The one exception is the data from the St Mary Spital collection, which was recorded by researchers from Museum of London Archaeology using methods outlined in Powers (2008). The methods used for the other collections are recorded below.

5.2.1 BONE COUNT AND SKELETAL COMPLETENESS

For an element to be included in the overall bone count at least two-thirds of the bone had to be present, and for a set of remains to be included in the overall

skeleton count, at least two-thirds of the bones had to be present. These percentages were chosen based on the knowledge that many other studies involving the analysis of skeletal remains use the same or similar percentage of completeness, making it easier for comparative purposes (Dawes and Magilton, 1980; Lilley, 1994). The pelvic girdle was divided into its three separate elements: the ilium, the ischium, and the pubis. Ribs were counted by the number of heads present. Auditory ossicles and the smaller cranial bones (i.e. lacrimal, palatine, vomer, and ethmoid) were not included in the overall bone count.

While robust methodology for skeletal completeness and preservation are necessary for accurate statistical analyses, traumas and palaeopathologies on fragmented skeletons may still provide insight into osteological analysis (Brickley and Buckberry, 2015). In light of this, the overall counts used in the statistical analyses only include skeletons that meet the above criteria, but less complete skeletons that present with traumatic injuries that can aide in our understanding of violence in the period are included in individual case studies when relevant.

5.2.2 SEX DETERMINATION

Sex determination was carried out using macroscopic and nonmetric methods. It was based on assessment of specific traits on the pelvis and skull that have been found to be variable between the sexes. For the skull, these traits included the roundness of the supraorbital margins, the slope of the forehead, the size of the

mastoids, the robusticity of the nuchal crest, the prominence of the inion protuberance, the robusticity of the zygoma root, and the flare of the gonions (Brothwell, 1981; Ferembach *et al.*, 1980). For the pelvis, traits included the acuteness of the angle of the greater sciatic notch, the presence of a preauricular sulcus, the curve of the subpubic angle, the definition of the ventral arc, the presence of a subpubic concavity, and the roundness of the ischiopubic ramus ridge (Buikstra and Ubelaker, 1994; Klales *et al.*, 2012; Phenice, 1969).

All traits present on a skeleton were analysed and graded using a five-point scale (See Table 5.2). An estimate of definite male (grade 1) or definite female (grade 5) was only given if at least one element of the pelvis was present. Sex estimation using only skull traits could only provide a sex estimate of probable male (grade 2) or probable female (grade 4) as it is a slightly less effective form of sex determination (Krogman and Isçan, 1986; Phenice, 1969; Stewart, 1979). The final sex estimation was determined by averaging the trait grades, excluding the trait when it was not present. Subadult sex estimation was not attempted.

Table 5.2: Grades Used for Each Sex Category

SEX	GRADE
Male	1
Male?	2
Intermediate	3
Female?	4
Female	5
Undetermined or trait not present	9

It should be noted that in preferencing certain morphological traits over others in the averaging calculation (i.e. the pelvis over the skull) there is likely to be a predilection for assessments of probable male and probable female over definite male and definite female. However, for the ease of statistical analysis the sexes

are pooled in the results section, making the differences between probable male/female and definite male/female irrelevant for the purpose of analysis in this thesis.

5.2.3 AGE DETERMINATION

Age determination for adults was also scored using macroscopic methods. These primarily included sternal rib morphology (Isçan *et al.*, 1984; Isçan *et al.*, 1985), pubic symphysis degeneration (Brooks and Suchey 1990; Buikstra and Ubelaker 1994: 24-32), and auricular surface degeneration (ibid; Lovejoy *et al.*, 1985; Meindl *et al.*, 1985). Dental attrition was used only in conjunction with other methods. It was scored using the methods cited in Brothwell (1981: 72), but only if at least two mandibular molars were present on each side. Aging using cranial suture fusion was not attempted. An age estimate was given for every trait present on a skeleton, then combined and fit into a broad age group. The adult age groups used in this research include: 18-25 years, 26-35 years, 36-45 years, >45 years, and undetermined adult (>18 years). These specific age groups were chosen as they are the same as those used by Museum of London Archaeology (MoLA) and the Museum of London (Powers, 2008), thus making it easier to compare the data collected by the author with that collected by MoLA (i.e. the St Mary Spital collection).

For subadults (assessed as individuals younger than 18 years), age was estimated using both metric and nonmetric means. Metric age estimation comprised the measurement of the diaphyseal length of all present long bones.

All measurements were taken using an osteometric board and the age assessed utilising information from Scheuer and Black (2000). The age estimates for each bone were pooled to obtain an overall estimate of age-at-death. Nonmetric estimation included analysis of epiphyseal fusion (ibid) and dental eruption (Gustafson and Koch, 1974). A combination of all three techniques was used when possible, but preference was given to dental eruption estimates in instances where the different techniques did not provide the same age, as this has been shown to be the most accurate method (Liversidge, 1994). Age-estimates were amalgamated into eight possible age groups: prenatal, perinatal, 1-6 months, 7-11 months, 1-5 years, 6-11 years, 12-17 years, and undetermined subadult (<18 years). These age groups were chosen for the same reasons as mentioned above.

It should be noted that choosing eighteen as the cut-off point for subadults is purely for methodological reasons. It is understood that "adulthood", "adolescence", and "childhood" had different cultural connotations in the medieval period than they do today and this is taken into consideration in the analysis and discussion of the results.

5.2.4 DETERMINATION OF CEMETERY TYPE

To determine any potential differences between the cemeteries, the collections were broken up into three distinct categories: lay cemeteries, monastic cemeteries, and monastic hospital cemeteries. The lay cemeteries included the skeletal assemblages from the parish churches of St Nicholas Shambles (GPO75),

St Lawrence Jewry (GYE92), St Benet Sherehog (ONE92), and the western cemetery from St Mary Graces (MIN86). The latter is included in this category as it was not associated with the abbey of St Mary Graces and most likely interred lay victims from the later waves of the Black Death (see Chapter 4).

Monastic cemeteries included the skeletal assemblages from the London Blackfriars (PIC87) and the abbey precinct of St Mary Graces (MIN86; including both extra- and intramural burials). The St Mary Spital (SRP98) and Spital Square (NRT85) collections was categorised separately as monastic hospital cemeteries since the individuals buried within them are likely to have included a mix of religious clergy and high-status patrons, as well as low status hospital inmates and other poor members of medieval London society (see Chapter 4 for a full assessment of the St Mary Spital demography).

5.2.5 TRAUMA

There is no consistent definition of trauma amongst bioarchaeologists, and the types of skeletal changes that are considered characteristic of trauma also vary between authors (Judd and Redfern, 2012). In this study, the types of trauma recorded were:

- **Bone fractures**, including diastatic fractures, trepanations, amputations, and blunt and sharp force trauma.
- **Dislocations** and **subluxations**, complete or partial separation of a joint.
- ***Myositis ossificans traumatica***, the ossification of muscle due to trauma.

Each of these types of trauma will be discussed in more detail below.

While instances of Schmorl's nodes and *osteochondritis dissecans* (along with other osteochondroses such as Osgood-Schlatter's disease, Perthes disease, and Scheuermann's disease) were recorded, they were not included in the overall numbers of individuals presenting with trauma, as their traumatic aetiology is uncertain (Resnick and Niwayama, 1988: 1528; Saluja *et al.*, 1986).

Intentional skeletal and dental mutilation was not common in medieval England and was not observed. Unintentional mutilation (i.e. through wearing tight shoes, etc.) was noted, but not considered trauma for the purposes of this research. Any pathologies or congenital abnormalities present on the skeleton were also recorded in order to identify any disorders that might have affected the presence and pattern of traumatic injuries.

5.2.5.1 BONE FRACTURES

Bone fractures were recorded as per standards in the field of bioarchaeology (Brickley and McKinley, 2004; Buikstra and Ubelaker, 1994; Roberts, 2006). This included identifying:

- The affected bone
- Side of the body
- Position of the fracture (e.g. distal third of the left fibula, right parietal)[41]
- Type of fracture, including the morphology and injury mechanism
- Degree of healing
- Healing complications

[41] When possible the distance from the epiphysis or suture was measured in millimetres

- Differential diagnosis, if appropriate

Digital photographs were taken of every identified trauma. They are included in this manuscript when they are crucial for accurately identifying the present trauma or when they are relevant to the discussion.

Care was taken to assess the type of trauma present. There are three main causes of fracture: acute injury (such as results from an accident or violent encounter), trauma as a result of an underlying disease, and stress injuries caused by overuse of the bone (Ortner, 2003: 120). This study primarily focuses on acute injuries; to help distinguish them from pathological fractures, all observed pathologies and genetic deformities were recorded.

For all bone fractures, identification of the morphology and injury mechanism was attempted. Unfortunately, in some instances, either due to the robusticity of healing, the size of the bone callus around a fracture, or the severity of infection around the trauma, the mechanism of injury could not be accurately determined without a radiograph. While the Museum of London already had some radiographs on file, due to a lack of funds, more radiographs could not be obtained leaving the mechanisms for some observed fractures uncertain.

There are two types of fracture morphology: Type I fractures, which are simple linear fractures, and Type II fractures, which are comminuted fractures and consist of multiple fracture lines (Gregg *et al.*, 1996: 31). There are also incomplete fractures in which the fracture line does not span the full width of the

bone. Fracture morphology was only positively assessed when the fracture line was clear. When the fracture line was obscured in some fashion, the morphology and mechanism is only postulated.

Type I fractures were classified using three primary categories (Gregg *et al*., 1996: 31):

- **Transverse:** this type of fracture cuts straight across the transverse plain of the bone and the subsequent fracture line is perpendicular to the longitudinal axis of the bone.
- **Oblique:** like a transverse fracture, an oblique fracture also cuts across the length of the transverse plain of the bone but at an approximately 45° angle.
- **Spiral:** spiral fractures cause a fracture line that curves up the longitudinal axis of the bone.

A Type II fracture, a comminuted fracture, is a complex break in which several fracture lines spread across the bone in various directions (Gregg *et al*., 1996: 31).

Incomplete fractures are most often observed in subadults due to the plasticity of their bones, but are also found in adults (Gregg *et al.*, 1996). They can result in hairline fractures (or cracks in the bone), which produce a fracture line similar to a complete oblique or spiral fracture, or a greenstick fracture in which the cortex of the bone breaks on one side and only buckles on the other (ibid). A greenstick

fracture can also result in a "crumpled" appearance to the bone (Hamblen and Simpson, 2007).

The type of fracture that results from an injury depends on the mechanisms involved. The two main forces involved in bone fracture are caused by direct and indirect trauma. There are three main mechanisms of bone fracture that result from direct forces (Gregg *et al.*, 1996; Perkins, 1958; Perkins, 1970):

- **Tapping:** caused by an object making direct, localised impact with a small area of bone, such as a kick or a punch. This type of force most often results in a transverse fracture line.
- **Crush:** caused by an object, making direct, widespread impact over a large area of bone. This type of force can result in either a transverse or comminuted fracture line and often the bone collapses in on itself. A depression fracture is one type of crush fracture, and it is discussed further in the section on blunt force trauma below.
- **Penetrating:** caused by a large, concentrated force making impact over a small area of bone. Various different fracture lines can result from this type of force including comminuted or greenstick. This mechanism is discussed further below in the section on puncture/projectile trauma.

There are five primary mechanisms of bone fracture that results from indirect forces (Alms, 1961; Gregg *et al.*, 1996):

- **Avulsion:** caused by the sudden contraction of a muscle. This mechanism can result in a segment of bone being pulled away from the rest or in

some cases, particularly at the patella and olecranon process of the ulna, a transverse fracture.

- **Angulation:** caused by compression on one side of the bone and tension on the other (i.e. bending of the bone). This most often results in an oblique fracture line.
- **Rotational:** caused by twisting of the bone (i.e. torsion). This force can often create a spiral fracture. In combination with a downward force, a spiral fracture to the distal third of the humerus is a common injury following arm wrestling (Heilbronner *et al*., 1980).
- **Compression:** caused by the harder part of a bone (usually the diaphysis) being driven into softer cancellous bone (usually the epiphysis). This can cause Y or T shaped fracture lines in the cancellous bone or impacted fractures.
- **Combination:** caused by a combination of any of the forces listed above. It can result in various different fracture morphologies.

Subadults are affected by fractures differently to adults (Lewis, 2007: 163). Their bones have a greater plasticity than adult bones, and they repair more rapidly and fully, making the ability to decipher trauma in subadult bones a difficult endeavour (ibid). There are, however, certain types of trauma that are common in subadults, including (Borden, 1974; Currey and Butler, 1975):

- **Greenstick fractures:** as mentioned above.
- **Plastic deformation:** caused by the same mechanism as a greenstick fracture, but without a fracture line. It is characterised by unilateral bowing of the involved bone.

- **Torus fractures:** characterised by a noticeable bulge at the metaphysis caused by compression of the bone.

Additionally, since their bones are still unfused, fractures between the epiphysis and metaphysis are also common childhood injuries. Epiphyseal/metaphyseal fractures were identified using the Salter-Harris classification, including the additional categories added by Rang and Ogden (Ogden, 1982; Rang, 1968; Salter and Harris, 1963):

- Type I: separation of the epiphysis from the metaphysis
- Type II: epiphyseal separation with a marginal fracture of the metaphysis
- Type III: intra-articular injury consisting of epiphyseal separation and longitudinal fracture of the epiphysis
- Type VI: intra-articular fracture extending across the epiphyseal plate into the metaphysis
- Type V: compression or crush injury of the epiphyseal plate

5.2.5.1.1 Cranial Blunt Force Trauma

Blunt force trauma is usually caused by tapping or crushing mechanisms in which the outer table of the cranial bone is compressed while the inner table undergoes forces of tension. This often results in a noticeable depression on the outer surface of the bone and a bulge on the inner surface. Blunt force trauma was assessed using the following criteria:

- Depressions on the outer table of the bone.
- Bulges on the inner table corresponding to depressions on the outer table.

- Radiating fracture lines, either linear or concentric (Knight, 1991), or comminuted fracture lines.
- Inward-driven adhering bone fragments (Berryman and Haun, 1996; Galloway, 1999).
- Contrecoup fractures in which, due to a large force, a fracture appears on the side of the cranium opposite the point of impact (Gurdjian, 1975).

5.2.5.1.2 Sharp Force Trauma

Sharp force trauma is produced by a cut from a bladed weapon. The criteria used to diagnosis sharp force trauma included (Boylston, 2000; Wakely, 1997: 30):

- Incision marks with well-defined edges.
- A smooth and flat appearance to the margins of the injury.
- Linearity of the cut marks.
- Although it was not used as a necessary criterion for diagnosis[42], smaller parallel cut marks observed on the smooth margins of the wound.
- Hinge fractures.

Additionally, if the incision passes through the bone at an angle, there may be spalling or splintering of the bone, seen on the opposite margin to the cut mark (Boylston, 2000).

5.2.5.1.3 Projectile Trauma

As noted above, projectile trauma can create various types of fracture lines. The morphology of the fracture often depends on the velocity of the projectile. In the

[42] As the use of microscopy was unavailable, only macroscopic markings could be observed.

clinical literature, low-velocity injuries result from projectiles travelling at 1000 feet per second or less, while high-velocity injuries result from projectiles travelling at 2000 feet per second or less (Gellman *et al.*, 2003). A low-velocity projectile creates a concentrated force on a small area of bone, causing that fragment of bone to give way. The resulting injury is usually severe but localised. A high-velocity projectile, due to the high amount of transferred kinetic energy, often causes a widespread comminuted fracture, which can have a similar morphology to a blunt force injury (ibid; Berryman and Symes, 1998). Additionally, the shock waves created by high velocity projectile injury can cause fractures to occur to other areas of the bone not directly associated with the point of impact, called contrecoup fracture (Harvey *et al.*, 1962.). Projectile trauma was only positively identified by projectile points imbedded in the bone, although it was hypothesised based on the lesion's size and general morphology.

5.2.5.1.4 Puncture Trauma

Puncture trauma can result from blunt force, sharp force, or projectile weapons (Novak, 2000: 97). In this study, it is categorised by small lesions that penetrated the cortical bone with evidence of internal bevelling, smooth fracture surfaces, and/or radiating fracture lines. While it is often difficult to determine what type of weapon caused a puncture injury (ibid), by using a combination of clinical literature and comparisons with lesions of similar size and shape discovered on other contemporaneous human skeletal remains, possible weapons can be proposed.

5.2.5.2 DEGREE OF HEALING

Any lesion displaying signs of healing was characterised as an antemortem injury. If no healing was observed, the traumatic lesion was distinguished between perimortem trauma and post-mortem trauma using criteria outlined below.

Antemortem trauma consisted of fractures that displayed at least some degree of healing (i.e. evidence of at least some bone remodelling). Criteria included: new bone formation, rounded/smooth fracture margins and fracture surfaces, sub-periosteal bone expansion, and callus formation (Ortner, 2003: 126).

The prefix peri- means at or around the time of death. Consequently, perimortem trauma includes all injuries, which exhibit no signs of healing but present with certain criteria (identified below) that distinguish it from post-mortem damage. It should be noted that a perimortem injury does not necessarily mean that the observed injury contributed to the individual's death. The timing of bone healing can vary between individuals, particularly between adults and subadults (Lewis, 2007: 167-68), but it is estimated that the majority of individuals will start to display macroscopic signs of healing within two weeks following the occurrence of the injury (Mann and Hunt, 2005). This means that individuals could live for weeks without showing evidence of remodelling, and this distinction cannot be observed in the skeletal remains. Similarly, for a period after death, estimated at around five months (Wieberg and Wescott, 2008), bone fractures will have a similar morphology to fractures occurring during life and thus, are unable to be distinguished from one another.

Distinguishing perimortem from postmortem trauma depends on the level of collagen present in the bone at the time of fracture. For a diagnosis of perimortem trauma at least two of the following criteria had to be present (Berryman and Haun, 1996; Galloway, 1999; Moraitis and Spiliopoulou, 2006; Moraitis and Spiliopoulou, 2008; Oh, 1983; Sauer, 1998; Ubelaker and Adams, 1995):

- Bevelling on the inner aspect of the coup fracture.
- Adhering bone around the margins of the coup fracture.
- Unhealed radiating fracture lines, linear or concentric.
- Sharp, oblique angles of fracture margins and smooth fracture surfaces.
- Helical or spiral fracture outlines.
- Unhealed contrecoup fractures.
- Butterfly fractures to long bones.
- Spalling, splintering, or hinge fractures.
- Consistent colouring to all aspects of the fracture and surrounding bone.

5.2.5.3 HEALING COMPLICATIONS

There are many complications that can arise from an improperly healed fracture, a brief outline of more commonly occurring ones, and how they were identified for this research are described below.

Infections are a common complication following a bone fracture and are more likely to occur if the fracture is open (i.e. the fracture caused a complete rupture in the soft tissue) as the exposure to the air invites the spread of bacteria

(Waldron, 2009). But, closed fractures are also at risk of infection. While infections resulting from fracture can either be acute or chronic, usually only long-lived chronic infections can be observed on the bone. Typically, the type of infection observed on skeletons in relation to fracture complications are non-specific, usually periostitis or osteomyelitis (Ortner, 2003: 181; Resnick and Niwayama, 1995; Roberts and Manchester, 2010: 171-2).

Non-union is when the two ends of a fracture fail to unite during the healing process, leaving the bone in two pieces. Causes for this complication include (Hamblen and Simpson, 2007):

- Infection (as noted above).
- Incomplete reduction causing a large gap between the two ends.
- Excessive movement of the injury during the healing process.
- The growth of soft tissue between the fragments.
- Loss of the fracture haematoma.
- Medications such as non-steroidal anti-inflammatory drugs (not a likely cause in archaeological specimens).
- Pathological destruction of the bone, such as caused by a tumour.

A **delayed union** is different from a true non-union fracture in that they do eventually unite, just not within the expected time frame (Hamblen and Simpson, 2007).

A fracture can also cause a disruption of the blood supply to the bone, which leads to the death of the bone, a process called **necrosis**. Through this process an area of dead bone, called a sequestrum is formed (Ortner, 2003: 129).

A fracture can often cause damage to nearby muscles (or vice versa). In some instances, this trauma causes bone formation within the muscle tissue itself, either as a bony projection attached to the fractured bone or as an entirely separate piece of bone (Ortner, 2003: 133-134). The resulting exotosis is called a *myositis ossificans traumatica* (this will be discussed further below).

Ankylosis is another complication arising from improperly healed fractures in which adjacent bones become fused. Fusion of adjacent bones is particularly common when a fracture affects a joint surface (Ortner, 2003: 157). This can also be a result of disease, so care must be taken when identifying the cause of the fusion, with an observable fracture line being necessary for the identification of trauma.

Bone fracture can often cause the development of **osteoarthritis**, particularly if the fracture is located on a joint surface. The presence of osteoarthritis can often cause observation of the fracture to be obstructed, and hence distinguishing traumatic osteoarthritis from age-induced osteoarthritis can be difficult without a radiograph. However, if the observed osteoarthritis is unilateral, it may be traumatic in origin (Morse, 1969: 13).

Deformity is often a common complication of improperly set bone fractures. Four types of deformities were used to classify different types of antemortem fractures (Gregg *et al.*, 1996). These included:

- **Shift:** in which the two ends of the fractured bone do not properly realign after healing. The degree of shift was measured in millimetres.
- **Angulation:** in which one or both ends of the fractured bone heal at a different angle from its original position. The direction of angulation was noted and the degree of angulation was estimated to the nearest 10°.
- **Shortening:** in which both ends of fractured bone heal while they overlap each other, causing a loss in bone length. If the fracture was on a long bone, the degree of shortening was estimated based on the length of the corresponding bone on the other side of the body[43].
- **Rotation:** in which one (or both) end(s) of the fractured bone twist from their original position. The direction of rotation was noted.

5.2.5.4 PSEUDO-TRAUMA AND DIFFERENTIAL DIAGNOSES

Certain congenital or pathological conditions may cause changes to the bone that can share many characteristics of bone fractures or other types of trauma. For instance, *os acromiale* is a condition where a secondary centre of ossification on the acromion process remains unfused. It can often be confused with a non-union fracture of the acromion process. Other conditions can cause spontaneous bone fracture with no accidental or intentional cause, such as *osteogenesis imperfecta* (Paterson, 1990). This congenital condition is characterised by imperfections to the collagen structure in bones, which cause the bones to break

[43] Of course, only if the corresponding bone was present.

with little or no trauma. Other conditions that may affect bone fractures include brittle bone disease, vitamin D disorders such as rickets or osteomalacia, osteoporosis, and Menkes' syndrome (ibid).

Depression fractures, puncture trauma, and projectile trauma can easily be confused with different types of pathologies. Besides being traumatic in origin, holes and/or depressions in the calvarium can also be caused by congenital and developmental defects, pathological lesions caused by disease, surgical intervention (such as trepanations), and postmortem damage (Kaufman *et al*., 1997). To help avoid misdiagnosis, healed depression fractures were only assessed as such if they were larger than 5mm in diameter and smooth in appearance so as to rule out the possibility of confusing trauma with other pathological conditions such as epidermoid cysts, which have a lytic appearance (Bikmaz *et al.*, 2005; Rodríguez-Martín, 2007; Schulting and Fibiger, 2014: 283-284). Additionally, care was taken with any trauma appearing along sutures, as that is the location where developmental defects are most common. Post-mortem damage was ruled out based on the criteria outlined above.

5.2.5.5 DISLOCATIONS AND SUBLUXATIONS

Dislocations, the complete loss of contact between two joint components, and subluxations, the partial loss of contact between two joint components, can only be observed in skeletal remains if they remain dislocated for an extended period of time, causing observable changes to the bone (Lovell, 1997: 140). In many instances, these changes include bone deformation/growth or the formation of a

pseudo-joint on the part of the bone adjacent to the dislocated joint (Ubelaker, 1978: 81).

Dislocations are more common amongst adults, as a similar injury mechanism will often cause an epiphyseal fracture in a subadult (Lovell, 1997: 140). As with bone fracture, an attempt to distinguish between dislocations occurring from acute injury and underlying pathologies/congenital abnormalities was attempted. For example, a hip dislocation in association with hip dysplasia would be classified as a congenital dislocation.

5.2.5.6 MYOSITIS OSSIFICANS TRAUMATICA

As noted above, when in association with a bone fracture, *myositis ossificans traumatica* was noted as a complication arising during the healing process. However, it was also recorded as trauma when there was no concomitant fracture present. In both instances, an attempt was made to identify the muscle that resulted in the exotosis.

5.2.5.7 VIOLENCE-RELATED INJURIES (VRIs)

Human skeletal remains provide the most direct evidence of violence and warfare in the past (Knüsel, 2005; Larsen, 2015: 130; Walker, 2001). But, while this may be true in comparison to historical accounts or other archaeological finds, it is still imperfect in its interpretation. For instance, one can be a willing or a reluctant participant in violence, but in the archaeological record it is almost impossible to differentiate between the two. Additionally, it is possible to be accidentally shot with an arrow or cut with a blade. And, in fact, there is even

evidence of this in the London Coroners' Rolls: on August 16, 1339, John de Markeby, a goldsmith, accidentally stabbed himself with a knife while drunk; he died from his wounds within the day (Sharpe, 1913: 231). It is even more difficult to distinguish violence-related injuries in attritional cemeteries, as opposed to mass graves or short-lived catastrophe cemeteries, because linking injuries from a specific incident (such as a battle or other type of skirmish) between multiple individuals is almost impossible without being able to determine if they were buried at, or around, the same time. As such, without specific context, such as being excavated from a battle-site, any lesions present in archaeological remains will have some doubt as to the origin of the injury. This is a fact that cannot be fully circumvented, but can perhaps be mitigated by establishing concrete diagnostic criteria and determining levels of confidence. These criteria are examined below.

Although there are many factors working against an interpretation of violence in attritional skeletal material, it is possible to make educated inferences based on likelihood and firmly fixing the results with an historical setting and sociocultural context (Larsen, 2015: 130-131; Lovell, 1997: 166-167). Thus, identifying violence-related injuries (VRI) within a skeletal population can never be definitive. But, there are certain types and patterns of trauma that are highly suggestive of assault. Some of these injuries include (Brink *et al*., 1998; Walker, 2001):

- **Weapons-related trauma,** such as **sharp force trauma** and **puncture trauma** anywhere on the body, but particularly the skull, palmar side of the metacarpals and manual phalanges, ribs, and cervical vertebrae.

- **Cranial depression fractures** above the hat-brim line and greater than 5mm in length (Brickley and Smith, 2006; Guyomarc'h *et al*., 2010; Kremer *et al.*, 2008; Kremer and Sauvageau, 2009).
- **Facial fractures** (Scherer *et al.*, 1989).
- **Rib fractures** (Brickley, 2005)
- **Metacarpal impact fractures** (Brickley and Smith, 2006).
- **Parry fractures** in association with other VRI (Judd, 2008).
- **Hyoid fractures** (Ubelaker, 1992).

Each type of injury and its association with violence is discussed in more detail below.

To examine the level of confidence with which an injury may be considered violence-related, the criteria outlined in the Istanbul Protocol (United Nations, 2004), a terminological framework that can help clarify confidence levels of palaeopathological diagnosis (Appleby *et al.*, 2015b), were used. Using its recommendations, the terms used to identify confidence in the cause of injury include:

- *Not consistent* – the observed lesion(s) could not have been caused by violence.
- *Consistent with* – the observed lesion(s) could have been caused by violence, but the injuries are too non-specific and many other causes may be possible.
- *Highly consistent* – the observed lesion(s) could have been caused by violence, but there are a small number of other possible causes.

- *Typical of* – the observed lesions(s) is often a result of violence, but there may be other causes.
- *Diagnostic of* – the observed lesion(s) could not have been caused by anything other than violence.

5.2.5.7.1 Weapons-Related Trauma

Weapons-related trauma can be categorised into three different types: blunt force trauma (i.e. tapping/crushing), sharp force trauma (i.e. cutting), and puncture trauma (i.e. piercing). The criteria used to distinguish between these different types are noted above. A weapon, such as an arrowhead, that remains embedded in the bone may be the most direct evidence for violence as the link between the weapon and the injury is self-evident[44]. Sharp force trauma, as well, can be linked to the use of a weapon or other tool and thus, has a relatively secure link with intentional violence (Jurmain, 2005: 214-215; Jurmain *et al.*, 2009).

With the exception of blunt force trauma, which may be more ambiguous (and is discussed further below), weapons-related trauma can often be given a confidence level of either highly consistent with or typical of violence. If the identifying-criteria for sharp force, puncture, or projectile trauma are secure, then the only possible differential diagnosis for these injuries is accidentally, as opposed to intentionally, being shot, stabbed, or cut with a weapon. If an individual displays multiple weapons-related injuries doubt over the cause of

[44] Although even this is not full proof as it does not preclude individuals who may have been accidentally shot, stabbed, or bludgeoned.

injury may be further removed, and it may be possible to suggest that the observed trauma is diagnostic of violence.

Intentional self-inflicted cuts appear be rare, accounting for only 2-3% of modern suicides. Additionally, most suicidal sharp force trauma tends to be located in fleshier areas of the body, such as the abdomen or the forearms, and is perhaps unlikely to affect the bone (Banasr *et al.*, 2003). One study from Sweden found that sharp force injuries to the head, and vertical, as opposed to horizontal, stab wounds to the chest appear to be highly predictive of homicide (Karlsson, 1998). Still, self-harm should always remain as a possible alternative explanation unless it can be securely shown that it would be impossible for the individual to have inflicted such wounds on his/herself.

The cause of blunt force trauma may have more alternative explanations than other types of weapons-related trauma. While it is often caused by being intentionally struck with a blunt object, blunt force trauma can also be caused by falls or by something accidentally striking the bone. To be able to increase confidence in the cause of blunt force trauma, the location of the injury (or injuries) is examined, with cranial vault trauma above the hat-brim line and parry fractures to the ulna perhaps being the most consistent with or highly consistent with violence. Both instances are discussed further below.

5.2.5.7.2 Skull Trauma

In both modern and historical research, the head appears to be the most common target for violence (Hussain *et al.*, 1994; Kjaerulff *et al.*, 1989; Knight,

1991: 156; McDowell *et al.*, 1992; Novak, 2000; Shepherd *et al.*, 1990). This is not surprising as it is easier to incapacitate someone by a blow to the head than elsewhere on the body. To aid in the identification of trauma to the skull, reconstruction of all the elements of the skull were carried out in fragmented remains.

Cranial vault. As noted above, although it is often caused by being struck with a blunt object, falling or hitting one's head can also cause cranial vault fractures indicative of blunt force trauma. To distinguish between the two, clinical research has determined that cranial vault fractures above the hat-brim line are more likely to be caused by intentional blows to the head than accidents (Kremer *et al.*, 2008; Kremer & Sauvageau, 2009). Kremer and Sauvageau (2009) found that 75.9% of fractures located above the hat-brim line were caused by intentional blows rather than accidental falls. Furthermore, they found that using the hat-brim line method in conjunction with at least two other criteria suggestive of intentional violence (i.e. fractures to the left side of the skull and multiple fractures) was 100% accurate. While it would not be expected that all cases using these criteria would be correct every time, this study suggests that it can be highly predictive of assault.

Besides the location of the injury above the hat-brim line, the shape of the trauma may also indicate its cause. Comminuted and depressed fractures on the cranial vault are more likely to results from blows, whereas linear or radial fractures are more likely to result from falls (Guyomarc'h *et al*, 2010). Additional criteria that might further confirm violence-related cranial blunt force trauma

are the presence of multiple skull fractures (particularly facial fractures) and the side lateralisation of fractures, with fractures to the left side of the skull more indicative of violence than those on the right (Kremer and Sauvageau, 2009).

If all of the criteria outlined above are present (i.e. large depression fractures above the hat-brim line with concomitant facial fractures all on the left side of the skull), it might be argued that the injuries are typical of violence. If only one or two criteria are present they may only be consistent with or highly consistent with violence.

Facial fractures. Facial fractures are a common injury resulting from interpersonal violence. In modern clinical literature, the vast majority of facial fractures (in some experiments, as many as 90% of cases) are caused by a punch or a kick, while a much smaller percentage are the result of motor vehicle accidents or falls (Guyomarc'h *et al.*, 2010; Scherer *et al.*, 1989). Additionally, in modernity, the facial region is a common target during assault, accounting for 62% of all injuries following a violent encounter in one research case (Shepherd *et al.*, 1990).

Patterns of facial trauma caused by violence vary. Mandibular fractures have often been cited as predominately being caused by violence, either urban or domestic (Arosarena *et al.*, 2009; Ferreira *et al.*, 2014). Zygomaticomaxillary complex (ZMC) fractures and orbital blowout fractures have also been frequently cited as violence-related injuries (Arosarena *et al.*, 2009; Bogusiak and Arkuszewski, 2010). While the cause of nasal fractures is often split between

accidental and intentional violence, the two may be distinguished by the fact that a transverse fracture across one or both of the nasal bones is most often caused by a direct blow to the bridge of the nose (Walker, 1997: 154).

Despite these possible associations, there does not appear to be a distinct relationship between aetiology and fracture type, except possibly the side of the body affected. Some clinical studies have shown that unilateral fractures to the left side of the facial complex are more commonly related to violent trauma than accidents or sports injuries, which primarily affect the right side or are bilateral (Brook and Wood, 1983; Iida *et al.*, 2001).

To attempt to distinguish between accidental and violent injuries, if only one facial fracture was present, it was assessed as consistent with violence with many other causes possible. If multiple facial fractures were present on the left side of the body, it was assessed as highly consistent with violence. If there were multiple facial fractures present in association with at least two other types of trauma highly consistent with violence (such as sharp force trauma), it was determined that the pattern of injuries was typical of violence.

Dental trauma. Dental trauma includes both tooth fractures as well as antemortem tooth loss in association with other skull trauma. While often tooth mutilation, whether voluntary or not, is considered a part of dental trauma (Merbs, 1989), it is not included as such here, in regards to violence-related injuries. This is mainly due to the fact that tooth mutilation is caused by the filing

of teeth either intentionally, through the use of tools, or unintentionally, through habits such as smoking a pipe, and not through violent encounters.

Antemortem tooth loss can occur congenitally, through infection and disease, through intentional extraction, accidental loss, or through trauma (Merbs, 1989). Determining between these different causes can be difficult. However, antemortem tooth loss in association with a fracture to the mandible, maxilla or another area of the maxillofacial region can help strengthen the argument for loss through trauma (ibid).

Dental fractures can affect the enamel, the enamel and dentine, or the enamel, dentine, and pulp. Only antemortem dental fractures were positively assessed as they are more easily identified than perimortem dental fractures (Ortner, 2003: 603). However, possible perimortem fractures in association with perimortem facial trauma may be hypothesised as having a violent origin.

5.2.5.7.3 Rib Fractures

The presence of rib fractures is also analysed in this paper as they are often caused by direct blunt chest trauma, and are a common injury following assault (Brickley, 2005). The archaeological record shows that rib fractures were a common injury in the past, particularly amongst older, lower status males (Brickley, 2005; Roberts and Cox, 2003), possibly suggesting that these fractures were caused by work-related accidents (Larsen, 2015). Thus, as they are a common injury associated with both falls and blows, analysing the type of

fracture and mechanism of injury can help determine the cause of the fracture(s).

Transverse fractures to any part of the rib, but particularly near the sternal end, are usually a result of direct trauma, whether from a fall or a blow (Breidenbach, 1937; DiMaio and DiMaio, 2001). However, multiple fractures to adjacent ribs are more likely to be associated with a fall than intentional violence, and thus were excluded from being defined as violence-related injuries (VRI). Compression of the chest (or indirect trauma) usually leads to oblique or greenstick fractures located anterior to the angle of the rib (Breidenbach, 1937). Rib fractures with concomitant injuries associated with accidents, such as fractured or dislocated upper and lower limbs, as well as individuals displaying signs of disease that may have predisposed them to rib fractures were omitted from the fracture count for VRI. While these criteria are useful in identifying potential violence-related rib fractures, the aetiology of rib fractures is not as secure as weapons-related trauma or skull trauma, as such they can only ever be categorised as consistent with violence. However, it there are several concomitant injuries that are also indicative of violence it may be determined that the observed injuries were either highly consistent with or typical of violence.

5.2.5.7.4 Metacarpal Fractures

Impact fractures at the distal end of a metacarpal shaft, particularly the fifth metacarpal, are common injuries following punching something (or someone) with a closed fist (Ali *et al.*, 1999; Brickley and Smith, 2006). In modern clinical

literature, they are known as boxer's fractures. Despite this association, the mechanism of injury for metacarpal fractures is accidental as often as it is violent (Gudmundsen and Borgen, 2009).

The identification of boxer's fractures reflects modern styles of boxing and/or fighting. However, different styles of fighting in the past may cause different patterns of injuries. Brickley and Smith (2006) suggest that Bennet's fractures, an avulsion fracture to the proximal joint of the first metacarpal, may be a result of "bareknuckle" boxing in which the fist is dorsally angled in an attempt to protect the hand from injury. Bony spurs on the distal articular head of the metacarpals can also result from chronic fighting (Hershkovitz *et al.*, 1996).

In order to discern between accidental and violence-related metacarpal fractures, certain criteria were considered: (1) which metacarpal was affected, with particular attention given to fractures of the fifth metacarpal and Bennet's fractures to the first metacarpal; (2) the location of the fracture on the bone, with the distal end of the shaft being predominately affected by punch-related trauma; (3) the type of fracture, with impacted fractures being more associated with violence than other types. Similar to rib fractures, while these criteria can help predict violence-related metacarpal fractures, the aetiology can never be certain and hence they can only ever be categorised as consistent with trauma, unless they are several concomitant injuries that are also indicative of violence.

5.2.5.7.5 Parry Fractures

A parry fracture is defined as a transverse fracture occurring on the distal half of the ulnar diaphysis with no concomitant fracture to the radius. As it can be confused with chronic ulna stress fractures, a slight degree of misalignment can help confirm a parry fracture diagnosis (Judd, 2008). It is usually the result of a direct blow to the forearm during the course of protecting oneself from a physical attack. There is much controversy around the parry fracture and its accuracy in being diagnosed as a violence-related injury, particularly as an ulnar shaft injury with similar characteristics can also be the result of a fall (Jurmain, 1999: 156). In this research, while a parry fracture may be preliminarily assessed as such based on the criteria listed above, they can only ever by consistent with violence, unless the individual presents with at least one other injury potentially indicative of violence.

5.2.5.7.6 Hyoid Fractures

A fractured hyoid is a common injury in strangulation (Ubelaker, 1992). However, due to the fact that the hyoid bone is seldom recovered during excavation, very few hyoid fractures have been discovered in human skeletal remains from archaeological sites.

5.2.5.7.7 Other Considerations

In modern societies, age is an important predicting factor in whether or not an injury is likely to have been caused by violence. The majority of cranial trauma to individuals aged 5-50 is a result of violence, whereas in individuals younger than 5 and older than 50, the main cause is falls (Hussain *et al.*, 1994). As such, in the

youngest and oldest age groups, more care was taken in determining the potential cause of injury, and it is likely that any injury would only be assessed as consistent with or highly consistent with violence.

Participation in sports is another common cause of trauma in modern populations, and can present with a similar pattern to violence-related injuries. Sports, particularly those used as a form of combat practice (i.e. jousting), existed in medieval England and participation in them was quite common, especially among men of high status. For example, in his *Description of the City of London* William Fitzstephen (1190?; 1772: 49) notes that: "On holidays, in summer, the pastime of the youth is to exercise themselves in archery, in running, leaping, wrestling, casting of stones, and flinging to certain distances…". Thus, tournament participation should be considered as an alternative explanation for certain injuries, particularly amongst men.

5.2.6 WEAPONS IDENTIFICATION AND DIRECTIONALITY

The type of weapon used in an assault is culturally influenced (Danielsen *et al.*, 1989). For instance, in modern western societies, blunt objects and personal weapons (i.e. fists and feet) are the most common weapons cited in assaults, whereas as in South Africa knives are the weapons of choice (Butchart and Brown, 1991; Shepherd *et al.*, 1990). When assessing weapons-related trauma, the historical context and the types of weapons common to that time period should be accounted for. This knowledge will inform as to what types of weapons may have possibly caused the observed injuries. For example, early

assessments of the skeletons from the Dornach site, thought to be victims from the 1499 battle between the Swiss and the army of Maximilian, suggested that the observed cranial injuries were likely to have been caused by halberds as they were the weapons of choice for that battle and the size and shape of the injuries were consistent with that type of weapon (Waldman, 2005: 100-102). Forensic experimentation later confirmed this hypothesis, although it also showed that swords were also used (Cooper, 2010).

Additionally, the pattern, direction, and location of injury may also be culturally influenced. Knüsel (2014) has argued that there may be a change in combative techniques between the high Middle Ages and the late Middle Ages. Using evidence from several different sites, he notes that individuals presenting with potential battle-related trauma from the 11th-13th century presented with more post-cranial injuries, while individuals from the 14th-16th centuries presented with more cranial injuries. This difference, he argues, may connote a shift towards a preference for striking the head in combat, perhaps to incapacitate one's opponent more quickly.

Solid methodology in determining weapon-type and directionality from skeletal trauma is, unfortunately, sparse. Attempts to recreate weapon-patterns using bone substitutes may be useful, but are often not perfect due to the fact that no material has yet been produced that can accurately reflect the structure of human bone (Cooper, 2010). Experiments using animal carcasses may be more useful, but there is still the problem of accurately recreating likely violent scenarios (Karasulas, 2004; Lewis, 2008). In some studies, the exact techniques

and criteria used to determine weapon-type are not explicitly revealed (see Wells, 1982: 169-171; Wenham, 1989). Still, despite their flaws, these experiments have shown some consistent results and currently offer us the only way in which to possibly identify weapons and directionality.

In terms of sharp force trauma, cut mark morphology has been shown to be highly depended on weapon morphology (Lewis, 2008). Specifically, forensic evidence has been able to successfully distinguish between long-bladed weapons, such as that of a sword, with short-bladed weapons, such as that of a knife or dagger. Lewis (2008) sums up the differing criteria:

> The observed differences between sword marks and knife marks can be summarized as follows: (a) swords produce cut marks that are deep, wide, with a straight kerf and damage on the sides of the mark, whereas knives produce shallow, narrow and often meandering kerfs and relatively little damage to the sides of the mark; (b) the kerf floor of sword marks can be either narrow and V-shaped or broader, U shaped with a flat bottom, whereas knife mark kerf floors are always V-shaped; (c) sword marks, when viewed in profile, tend to have one smooth, vertically curved wall, and one rough, vertically straight wall, forming a combined 'V' and 'U' shaped cross-section, whereas knife mark walls are small and V-shaped; (d) sword marks show damage (or higher amounts of damage) on the side of the cut mark opposite to the smooth, curved wall.

Additionally, the length of the lesion may also indicate what type of blade was used. In the study carried out by Lewis (2008), swords blades created lesions between 22.9mm and 24.2mm, while knives created lesions with a mean length of 12.7mm.

Puncture trauma has been shown to directly reflect the shape of the instrument used to pierce the bone, so determining the causative instrument can usually be

successfully carried out by comparing the measurements of the injury with the measurements of possible weapons (Cooper, 2010: 158; Novak, 2000: 97-98; this is discussed more below). However, the velocity of the weapon can affect the accuracy of this method. As noted above, low-velocity punctures are often characterised by neat holes in the bone, whereas high-velocity punctures can cause large comminuted fractures with radiating or concentric fractures (Berryman and Symes, 1998). Thus, with injuries caused by high velocity weapons the size and shape of the injury may be significantly different than the size and shape of the weapon.

In addition to the criteria noted above, an attempt was made to determine weapon-type by comparing the size and shape of skeletal trauma with that of medieval weapons (i.e. swords, knives, axes, and arrowheads) curated at the Museum of London. A breakdown of the average measurements of different types of blades that are used in this research can be found in Table 5.3.

Table 5.3: Measurements of medieval weapons from London

Measurement	**Knives/Daggers (N = 23)**			**Swords (N = 4)**			**Axes (N = 9)**		
(mm)	**Length**	**Width**	**Depth**	**Length**	**Width**	**Depth**	**Length**	**Width**	**Depth**
Mean	167	18	2.3	715	36	1	176	143	1
Median	157	17	2	675	46	1	191	154	1
Mode	105	25	2	NA	NA	1	NA	180	1
Maximum	360	42	1	880	55	2	247	230	2
Minimum	74	9	4	630	37	0.5	97	81	0.5

Blunt force trauma is harder to link to a specific weapon and can usually only be speculated. The best approach is to determine whether the surface area of the impact was diffuse or focal, and then postulate what types of instruments may be consistent with that type of injury (Berryman and Symes, 1998). As with sharp

force trauma, the size of the lesion may aid in narrowing down possible weapons (Wenham, 1989).

In terms of directionality, violence-related injuries to the left-hand side of the body are generally attributed to attacks from right-handed opponents, whereas injuries on the right-hand side may indicate a left-handed opponent (or possibly an accidental aetiology; Novak, 2001). However, a complication in determining directionality is that the position of the body and head (relative to each other as well as the attacker) during the attack is unknown. For this research, the directionality is hypothesised with the assumption that the head was faced forward at the time of the attack, but possible alternative head positions and its impact on directionality may be postulated in some instances.

For sharp force trauma, the aspect (or angle of entry) was noted for each observed specimen. If the walls of the cut mark were at an angle between 90 and 46 degrees from the bone surface, it was identified as a perpendicular blow (Humphrey and Hutchinson, 2001: 229; Lewis, 2008: Supplementary Key). If the walls of the cut mark were between 45 and 0 degrees from the bone surface, it was identified as a glancing blow (ibid). For glancing blows (as well as for perpendicular blows with at least some observed angulation), the direction of the angle can aid in the determination of handedness for the perpetrator: if the view from the anterior end of the injury shows the walls of the cut mark slanting to the left, the perpetrator is likely to be left-handed, whereas if the walls of the cut mark are angled to right, the perpetrator is likely to be right-handed (ibid).

5.2.7 STATISTICAL ANALYSIS

Crude prevalence was assessed using only skeletons in which three-fourths of the skeletal elements were present (as indicated above in the section on skeletal completeness). It was calculated by dividing the number of fractures (or a particular type of fracture as indicated) by the total number of skeletons (or subset of skeletons as indicated). True prevalence was assessed using individual skeletal elements where at least three-fourths of the bone was present (as indicated above in the section on skeletal completeness). It was calculated by dividing the number of fractures (or a particular type of fracture as indicated) by the total number of bones (or subset of bones as indicated).

Chi-square tests were used to compare trauma prevalence excepting when more than 20% of the expected number of sample sizes was less than five. In these instances, Fisher's Exact test was employed instead as it is a more accurate test to use with smaller sample sizes (Logan, 2010: 469; Zar, 1999). Significance was set at five per cent. For contingency tables that were larger than 2x2, the source of the result was determined by comparing the standardized residuals (Agresti, 2007; Delucchi, 1993; Sharpe, 2015). Any cells that were associated with a standardized residual with an absolute value greater than ±1.95 were considered to contribute significantly to the result. Cramér's V was calculated to determine the strength of the relationship[45]. For a statistically significant result to be considered meaningful, this measure had to be >0.1 (Cramér, 1946). All data were recorded in Excel and statistical analysis was carried out using RStudio.

[45] Cramér's V is equal to Phi in 2x2 contingency tables.

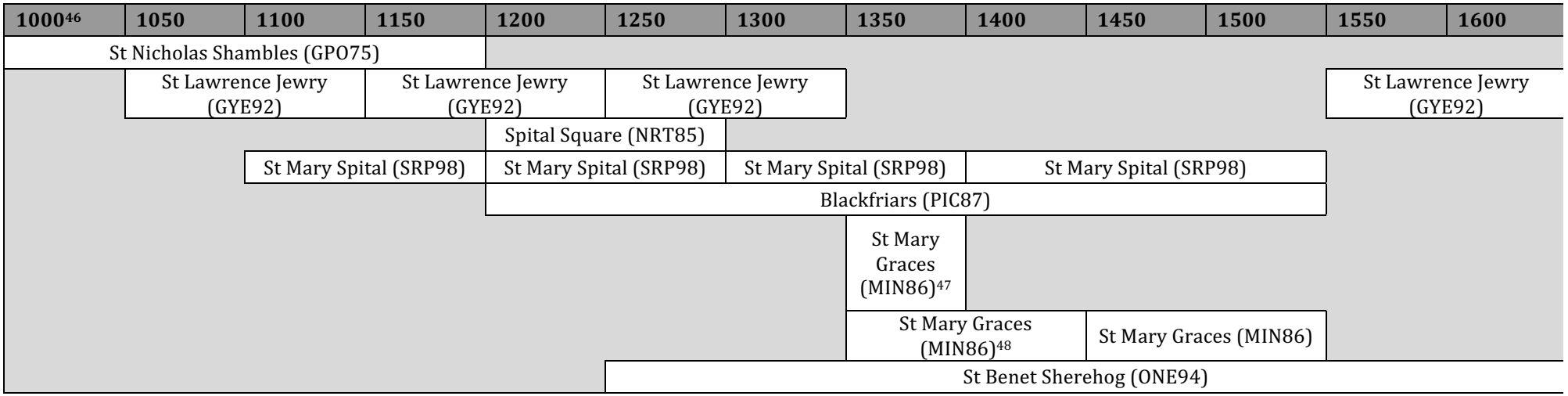
5.3 CONCLUSIONS

The archaeological context of the seven collections analysed in this thesis were reviewed in the appendix. A timeline of the collections, which lays out the dates of each cemetery in relation to each other, can be found in Figure 5.26. The timeline shows that there is much overlap between the collections, but that no more than two cemeteries can be linked to the same discrete time period. This can potentially hinder our ability to analyse chronological differences in the results. Additionally, the burial context (see appendix) shows that a few of the cemeteries, specifically St Lawrence Jewry and the London Blackfriars, were not fully excavated. This may suggest that the demography of the full burial population may not be accurately represented amongst the excavated individuals. In general, besides a few mass graves that may be evidence of epidemics, the vast majority of burials were typical of later medieval burials with little variation between them. As such, the archaeological context did not add much in the way of evidence of the life course for these individuals.

The osteological methods used in this research were ultimately similar to the ones used by the Museum of London and Museum of London Archaeology (Powers, 2008). This was to allow for a more accurate comparison between the collections personally analysed by the author and the data from the St Mary Spital (SRP98) collection. In terms of the overall accuracy of the methods, identifying trauma, particularly violence-related trauma, is not a straightforward or definitive process. Strong methodology based on past historical,

ethnographical, and clinical research is imperative to developing accurate criteria for the diagnosis of violence. In particular, while some headway has been made in terms of determining weapon-type and directionality, this is still a severely underdeveloped area of research. To allow for a more considered analysis of trauma in the future, more forensic studies analysing these aspects of violence should be carried out.

Figure 5.1: Timetable of Collection Dates



[46] Each column represents 50 years, so the first group from St Nicholas Shambles dates from 1000 to 1200.

[47] This group comprises those buried in the western cemetery of St Mary Graces (MIN86), which was used for lay victims of the later waves of the Black Death.

[48] These two groups from St Mary Graces (MIN86) represent both the intra- and extramural burials from the abbey precinct.

CHAPTER 6: RESULTS OF INDIVIDUAL COLLECTIONS

This chapter describes the presence of trauma, both accidental and violence-related[1], found amongst the medieval London skeletal assemblages analysed as part of this thesis. It focuses on each skeletal collection individually; combined results will not be discussed until the following chapter. Results of the trauma in relation to sex, age, and burial location are presented, and trauma characteristics such as fracture type, degree of healing, and complications, are discussed when relevant. In order to fully describe the extent of violence within these skeletal collections, individual case reports that are particularly significant in terms of violent trauma are specifically highlighted. The possible weapon-type and directionality are also hypothesised. As the Mary Spital (SRP98) collection was not personally analysed by the author, it is only discussed here in generalised terms with no qualitative analysis of injuries. Dislocations and *myositis ossificans traumatica* are only briefly discussed, as the amount present amongst the collections was small and there is only one instance that can potentially be linked to violence.

6.1 ST NICHOLAS SHAMBLES (GPO75)

The St Nicholas Shambles (GPO75) collection is comprised of 234 individuals, of which 218 were analysed for this study. As indicated in Chapters 4 and 5 they are roughly dated to between the 11th and 12th centuries. This collection

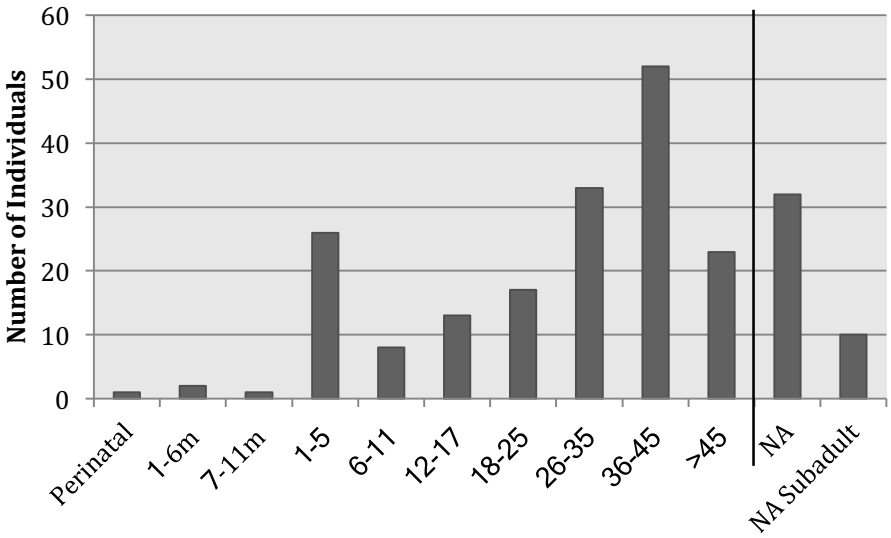
[1] As identified based on the criteria outlined in the methods section.

presented with a very even sex ratio of 0.9:1, with slightly more females present than males (Table 6.1). In general, the number of individuals increased with age with two notable exceptions (Figure 6.1). There were an anomalously large number of individuals aged 1-5 years present, perhaps indicating that this portion of the population had a greater risk of death. For those that reached adulthood, age-at-death peaked between 36-45 years, with a much smaller number of individuals aged older than 45 present in the collection. Both males and females presented with a similar age-at-death profile with no discernible differences between them (Table 6.2).

Table 6.1: Number of Individuals by Sex (GPO75)

SEX	N	% OF TOTAL
Males	53	24.3%
Intermediates	2	0.9%
Females	60	27.5%
NA	42	19.3%
Subadults	61	28.0%
TOTAL	**218**	**100.0%**

Figure 6.1: Number of Individuals by Age Category (GPO75)



NA and NA Subadult are the classifications for adults and subadults whose age could not be determined

Table 6.2: Number of Adults by Sex and Age (GPO75)

AGE	TOTAL	MALES		INTERMEDIATES		FEMALES		UNKNOWNS	
	N	N	%	N	%	N	%	N	%
18-25	17	6	35.3%	1	5.9%	7	41.2%	3	17.6%
25-36	33	11	33.3%	1	3.0%	15	45.5%	6	18.2%
36-45	52	24	46.2%	0	0.0%	22	42.3%	6	11.5%
>45	23	8	34.8%	0	0.0%	11	47.8%	4	17.4%
NA	32	4	12.5%	0	0.0%	5	15.6%	23	71.9%
TOTAL	**157**	**53**	**33.8%**	**2**	**1.3%**	**60**	**38.2%**	**42**	**26.8%**

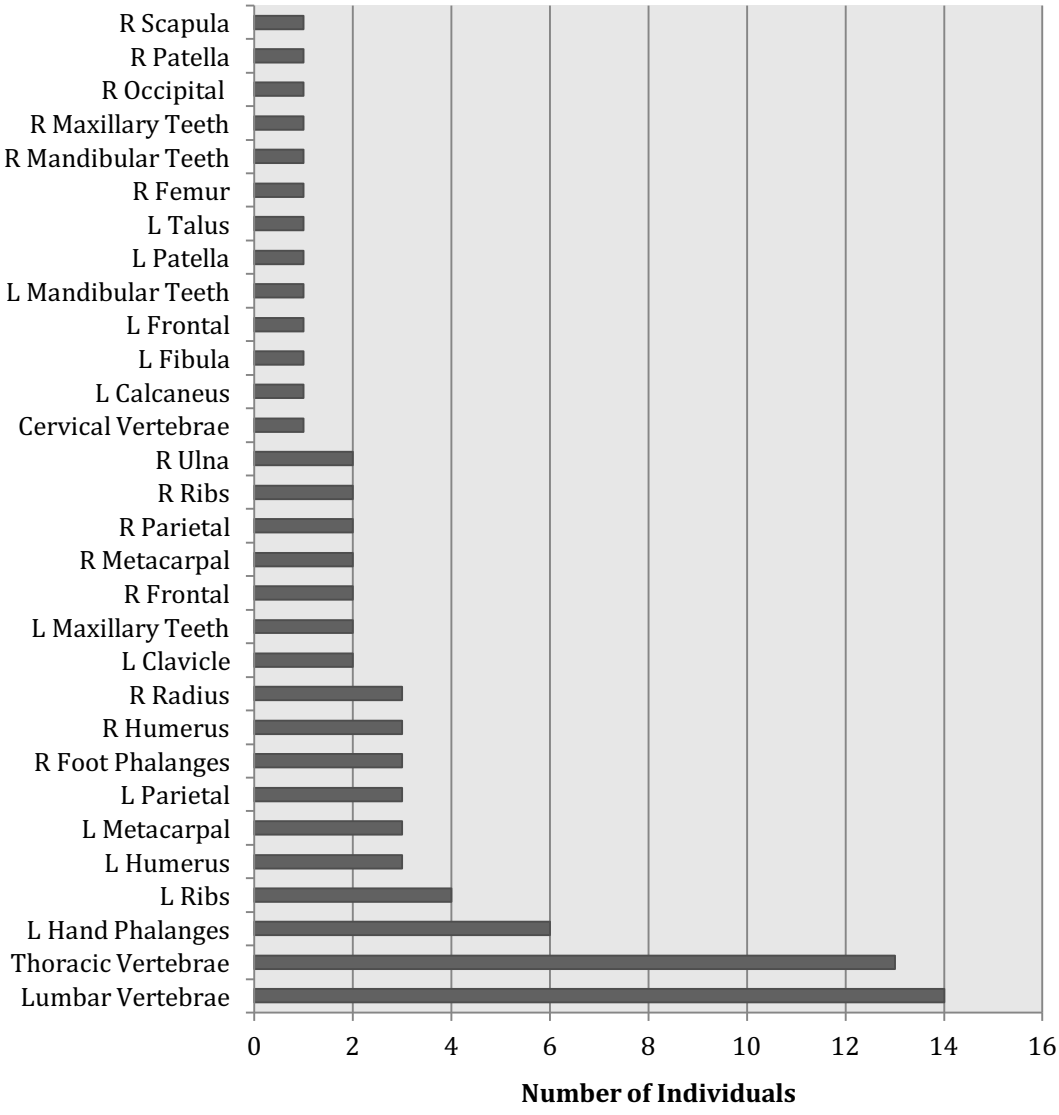
6.1.2 TRAUMA

In the St Nicholas Shambles (GPO75) collection a total of 57 individuals presented with at least one fracture, representing 26.1% (57/218) of the total. The 57 individuals had a total of 96 fractures between them. Thirty-seven individuals (64.9%: 37/57) only presented with one fracture, whereas twenty (35.1%: 20/57) had two or more fractures. The fractures were located throughout the body with the largest number found in the vertebrae: 14 individuals presented with fractures to the lumbar vertebrae and 13 individuals had fractures to the thoracic vertebrae. The location with the next largest number of fractures was the left hand phalanges with six. See Figure 6.2 for a full distribution of fracture locations by individual.

Males had the largest proportion of fractures with 45.3% (24/53) presenting with at least one fracture. Females and adults whose sex could not be determined presented with 28.3% (17/60) and 28.6% (12/42) respectively. Subadults had the smallest number of fractures with 4.9% (3/61). There was no statistically significant difference between the sexes. There was, however, a statistically significant difference between the number of adults presenting with fractures and the number of subadults presenting with fractures (χ^2 = 18.27, df =

1, $p < 0.001$, $\Phi_c = 0.29$). Table 6.3 shows the full distribution of fractures by sex category.

Figure 6.2: Number of Individuals with Fractures by Location (GPO75)



In terms of age distribution, individuals aged >45 had the largest crude prevalence of fractures (47.8%: 11/23). Individuals aged 18-25 followed next with 47.2% (8/17), then individuals aged 25-36 and 36-45 with 39.4% (13/33) and 30.8% (16/52) presenting with fractures respectively. Interestingly, these results do not coincide with a predicted accumulation of fractures with age, but

Table 6.3: Crude Prevalence of All Fractures by Sex and Age (GPO75)

AGE	MALES			INTERMEDIATES			FEMALES			UNKNOWNS			SUBADULTS			TOTAL		
	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%
Perinatal	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0.0%	**1**	**0**	**0.0%**
1-6m	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0.0%	**2**	**0**	**0.0%**
7-11m	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0.0%	**1**	**0**	**0.0%**
1-5	-	-	-	-	-	-	-	-	-	-	-	-	26	0	0.0%	**26**	**0**	**0.0%**
6-11	-	-	-	-	-	-	-	-	-	-	-	-	8	0	0.0%	**8**	**0**	**0.0%**
12-17	-	-	-	-	-	-	-	-	-	-	-	-	13	3	23.1%	**13**	**3**	**23.1%**
18-25	6	4	66.7%	1	1	100.0%	7	2	28.6%	3	1	33.3%	-	-	-	**17**	**8**	**47.1%**
26-35	11	6	54.5%	1	0	0.0%	15	5	33.3%	6	2	33.3%	-	-	-	**33**	**13**	**39.4%**
36-45	24	8	33.3%	0	0	0.0%	22	6	27.3%	6	2	33.3%	-	-	-	**52**	**16**	**30.8%**
>45	8	5	62.5%	0	0	0.0%	11	4	36.4%	4	2	50.0%	-	-	-	**23**	**11**	**47.8%**
NA	4	1	25.0%	0	0	0.0%	5	0	0.0%	23	5	21.7%	-	-	-	**32**	**6**	**18.8%**
SA NA	-	-	-	-	-	-	-	-	-	-	-	-	10	0	0.0%	**10**	**0**	**0.0%**
TOTAL	**53**	**24**	**45.3%**	**2**	**1**	**50.0%**	**60**	**17**	**28.3%**	**42**	**12**	**28.6%**	**61**	**3**	**4.9%**	**218**	**57**	**26.1%**

Table 6.4: Crude Prevalence of VRI by Sex and Age (GPO75)

AGE	MALES			INTERMEDIATES			FEMALES			UNKNOWNS			SUBADULTS			TOTAL		
	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%
Perinatal	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0.0%	**1**	**0**	**0.0%**
1-6m	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0.0%	**2**	**0**	**0.0%**
7-11m	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0.0%	**1**	**0**	**0.0%**
1-5	-	-	-	-	-	-	-	-	-	-	-	-	26	0	0.0%	**26**	**0**	**0.0%**
6-11	-	-	-	-	-	-	-	-	-	-	-	-	8	0	0.0%	**8**	**0**	**0.0%**
12-17	-	-	-	-	-	-	-	-	-	-	-	-	13	1	7.7%	**13**	**1**	**7.7%**
18-25	6	2	33.3%	1	0	0.0%	7	2	28.6%	3	1	33.3%	-	-	-	**17**	**5**	**29.4%**
26-35	11	3	27.3%	1	0	0.0%	15	2	13.3%	6	1	16.7%	-	-	-	**33**	**6**	**18.2%**
36-45	24	2	8.3%	0	0	0.0%	22	1	4.5%	6	1	16.7%	-	-	-	**52**	**4**	**7.7%**
>45	8	2	25.0%	0	0	0.0%	11	0	0.0%	4	1	25.0%	-	-	-	**23**	**3**	**13.0%**
NA	4	1	25.0%	0	0	0.0%	5	0	0.0%	23	2	8.7%	-	-	-	**32**	**3**	**9.4%**
SA NA	-	-	-	-	-	-	-	-	-	-	-	-	10	0	0.0%	**10**	**0**	**0.0%**
TOTAL	**53**	**10**	**18.9%**	**2**	**0**	**0.0%**	**60**	**5**	**8.3%**	**42**	**6**	**14.3%**	**61**	**1**	**1.6%**	**218**	**22**	**10.1%**

there are no significant differences between the age groups. Adults of undetermined age had the smallest proportion of fractures with 28.1% in the adult age groups. Regarding subadults, 23.1% (3/13) of subadults aged 12-17 presented with fractures. None of the subadults in the other age groups had any fractures. Table 6.3 shows the full distribution of fractured individuals broken down by age.

There was only one individual that presented with a possible dislocation. The individual, a male aged older than 45 (5306), presented with joint flaring and severe osteoarthritis with eburnation of the distal joint surface of the left humerus and the proximal joint surfaces of the left radius and ulna. There were two individuals with possible *myositis ossificans traumatica*. One individual, a male aged 26-35 (5316), presented with an exostosis on the distal third of the right fibular diaphysis. The other individual, aged 36-45 and of unidentified sex (5236), presented with an exostosis on the proximal third of the right femora diaphysis. The cause of these three injuries is uncertain. But, due to their location and aetiology, they are more likely to be accidental than violence-related.

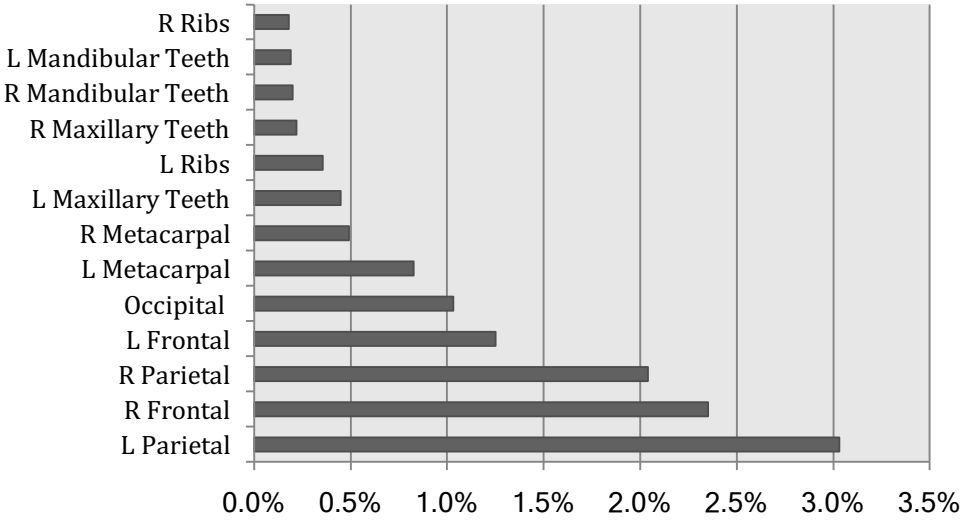
6.1.2.1 VIOLENCE-RELATED INJURIES (VRIs)

There were 22 individuals in the St Nicholas Shambles (GPO75) collection with at least one fracture at a location on the body that indicates it was at least consistent with violence[50] (Table 6.4). This subset represents 10.1% (22/218) of the total population. Fourteen of these individuals only presented with one

[50] See Chapter 5 for the criteria used to determine the confidence level for an injury being caused by violence.

fracture, whereas eight presented with two or more fractures. One individual (5206) presented with over 12 fractures in six different locations. However, the majority were microfractures to the vertebrae and only one fracture was in a location that might indicate it was caused by interpersonal violence. The majority of VRI (54.5%: 12/22) was found across various locations on the skull, although the metacarpals presented with a fair number as well, representing 22.7% (5/22) of all individuals affected by possible VRI. In relation to true prevalence of fractures, the left parietal was the bone most often affected by VRI with a true prevalence of 3.0% (3/99; Figure 6.3). The right frontal and right parietal were the next most affected with a true prevalence of 2.4% (2/85) and 2.0% (2/98) respectively.

Figure 6.3: True Prevalence of VRI by affected bone (GPO75)



In general, males had the largest proportion of VRIs with 18.9% (10/53) affected. Undetermined adults followed with 14.3% (6/42). Only 8.3% (5/60) of females presented with a VRI. There was no statistically significant difference between the males and females. However, there was a statistically significant difference between the sexes when isolating VRI strictly to cranial trauma: 9.4%

(5/53) of males and 0.0% (0/60) of females presented with VRI to the cranial vault (Fisher's Exact Test: $p = 0.02$, $\Phi_c = 0.19$). Males presented with a greater percentage of cranial vault fractures than would be expected while females presented with less. As with overall prevalence, there was a significant difference in the proportion of adults and subadults presenting with VRI: 13.4% (21/157) of adults to 1.6% (1/61) of subadults ($\chi^2 = 5.4385$, $df = 1$, $p = 0.02$, $\Phi_c = 0.16$). The full distribution of VRI by sex is shown in Table 6.4.

Several of the age groups were similarly affected by VRI and no significant differences between them could be discerned. Interestingly, the youngest adult age group, 18-25, presented with the highest crude prevalence of VRI with 29.4% (5/17) affected. They were followed by adults aged 26-35 with 18.2% (6/33) affected. Only one subadult, aged 12-17, presented with a VRI, representing 7.7% of the subadults in that age group (1/13). No subadults younger than 12 presented with VRI. A full distribution of VRI by age group is shown in Table 6.4.

Five of the 22 individuals with VRI presented with at least one fracture that appeared to be perimortem in nature. One individual (5133) with a fully healed depressed fracture to the right parietal also presented with a fracture to the right scapular spine that was in the process of healing at the time of death. In total, four of the five perimortem injuries were located on the cranial vault and one was located on a left middle rib. Four of the five adults with perimortem trauma were male and the other individual's sex could not be determined. The specifics

of these injuries are discussed in further detail below. Table 6.5 describes all of the individuals affected by possible VRI.

Table 6.5: Individuals with Possible VRI (GPO75)

Context #	Sex	Age	# of Fractures	Location	Notes
5047	M?	NA	1	Frontal	SFT – perimortem
5048	NA	26-35	1	Maxillary M3	Enamel fracture
5053	F?	26-35	1	Mandibular M2	
5079	F?	36-45	1	Upper left rib	Transverse?
5086	F	18-25	1	Left 2nd metacarpal	Impacted
5093	M	26-35	1	Right 5th metacarpal	Impacted
5096	M	NA	1	Right parietal	Puncture – perimortem
5115	NA	>45	1	Maxillary I1	
5133	NA	NA	2	Right scapula; right parietal	Parietal – healed BFT; scapula in process of healing
5141	M?	>45	1	Left middle rib	Puncture – perimortem
5147	NA	SA 12-17	1	Left parietal	DD: skeletal lesion
5157	M	>45	2	T6 – spinous process; right 1st metacarpal	Bennet's fracture
5158	F	36-45	1	Left lower rib	Transverse?
5195	M?	36-45	1	Right occipital	Healed BFT
5201	M?	26-35	3	Right frontal; left frontal; left parietal	BFT and puncture - perimortem
5203	M?	18-25	2	Right maxillary canine and left 5th intermediate hand phalanx	Enamel fracture
5206	F	26-35	12	Right 1st proximal foot phalanx; T7-L2 centra; L5 – centrum; left 2nd metacarpal; left 2nd proximal hand phalanges	Impacted
5236	NA	36-45	6	T8-10 centra; L5 – centrum; right 11th rib (x2); right radius	Greenstick/oblique
5237	M	18-25	1	Left frontal; right parietal; left parietal; right temporal	SFT – perimortem
5258	NA	NA	2	Right 6th rib; left 12th rib	Transverse; greenstick
5294	M	26-35	2	T12 – centrum; left 2nd metacarpal	Impacted
5309	NA	18-25	1	Mandibular M2	Enamel fracture

6.1.2.1.1 Skull Trauma

Twelve out of the 22 individuals with possible VRI (54.5%) presented with trauma to the skull. Six of the individuals were male, one was female, one was a subadult aged 12-17, and four were adults whose age could not be determined.

Seven individuals presented with trauma to the cranial vault while five presented with dental fractures. No individuals presented with facial trauma.

6.1.2.1.1.1 Cranial Vault Trauma

Three individuals, one male, one subadult, and one adult of unknown sex and age presented with healed depression fractures to the cranial vault indicative of blunt force trauma. Two individuals, both male, presented with sharp force trauma to the cranial vault. Both sharp force injuries were completely unhealed. Another two individuals, also both male, presented with puncture trauma to the cranial vault. Both of these injuries were also unhealed. The last individual (5201) with cranial vault trauma presented with two perimortem blunt force lesions and one perimortem puncture wound. All cases of cranial vault trauma are discussed further below.

Blunt Force Trauma. Individual 5133, an adult of unknown sex and age, presented with one healed depression fracture on the right parietal. The lesion was 30mm in diameter and quite shallow. The endocranium did not appear to be affected. This individual also presented with a healing, non-union fracture to the right scapular spine at the spinoglenoid notch. As these two injuries display different levels of healing, it is likely that they occurred from two separate incidents. The size (>5mm in diameter) and location (above the hat-brim line) of the depression fracture is consistent with violence.

Individual 5195, a probable male aged 36-45, had a healed depression fracture to the right occipital near the right side of the nuchal crest. The lesion was 20mm in

diameter with radiating fracture lines. The right side of the nuchal crest was completely obliterated and the injury affected the internal structure of the endocranium. Due to the location at the base of the skull, below the hat brim line, this injury is not consistent with violence-related injuries and is not counted in further instances of VRI.

Individual 5147, a subadult aged 12-17, presented with a depression fracture on the left parietal. The lesion is 5mm in diameter, quite shallow, and does not appear to have affected the endocranium. While the lesion is located above the hat-brim line and on the left side of the cranium, its small size may warrant a differential diagnosis. Therefore, this injury is consistent with violent-related trauma, but may be due to other causes as well.

The individual with the perimortem blunt force trauma (5201) is discussed below in the case study section. Overall, there were only three individuals with blunt force trauma that was at least consistent with violence (5133, 5147, and 5201, which is discussed below, all males). In Chapter 4 we saw that many of the individuals in St Nicholas Shambles may have been butchers and it was also highlighted that they may have been at risk of blunt force injuries due to kicks or trampling from live animals. This offers a potential alternative explanation for the cause of these injuries. However, for individuals 5133 and 5147 the healed depression fractures were quite small (~30mm and 5mm respectively) for an injury from livestock, which is likely to produce a much larger injury (Zhang *et al.*, 2012). The possibility of a livestock injury for individual 5133 will be discussed in this case study.

Sharp Force Trauma. Two individuals presented with injuries indicative of sharp force trauma. Individual 5047, a probable male of unknown age, presented with a sharp force lesion to the right side of the frontal bone, approximately 50mm from the supraorbital ridge (Figure 6.4). The lesion was 30mm in length and 15mm in depth. There are two large hinge fractures on the anterior end of the lesion, suggesting that the blade may have been twisted upon extraction. No other injuries were found on the skeleton, although the lower limbs and left hand were missing. The location of the injury on the cranium as well as the characteristics of sharp force trauma indicate that this injury is typical of violence. While another cause, such as accidentally being struck by a blade – particularly a butcher's knife given this individual's possible occupation, is possible, as discussed below, the location of the injury suggests that it is not the most likely scenario (Barnham and Kerby, 1981; Ardebili *et al.*, 2000).

As the injury does not completely penetrate the endocranium, it is possible to see where the blade stopped. This kerf is linear suggesting a straight-bladed weapon. Additionally, the lateral margins of the injury are not finite, indicating that the blade was most likely larger than 30mm, the length of the injury. This evidence combined implies that a sword is perhaps the most likely weapon to have caused this injury (see Lewis, 2008). The walls of the lesion are at an approximately 45° angle, starting posteriorly and ending anteriorly, indicative of a glancing blow (Humphrey and Hutchinson, 2001: 229). This, in conjunction with the location of the injury on the right side of the frontal bone, indicates that the perpetrator either attacked from the right side of the individual (if his head was facing

forward at the time of the incident) or from the front of the individual (if his head was turned to the left at the time).

Figure 6.4: Individual 5047, male of unknown age, presenting with sharp force trauma. (GPO75)



Individual 5237, a male aged 18-25, presented with a very large traumatic lesion extending from the left frontal, across both parietals, and down to the right temporal (Figure 6.5a). It measures approximately 200mm in length with the width being difficult to determine due to warping of the cranium. The injury fully penetrates the endocranium and there is no evidence of healing. The lesion had two fractures radiating out across the frontal and temporal bones (the radiating fractures seen on both parietals are caused by postmortem damage). There was also partial retention of bone fragments at the margins of the lesion near the coronal suture and bevelling on the inner table (Figure 6.5b).

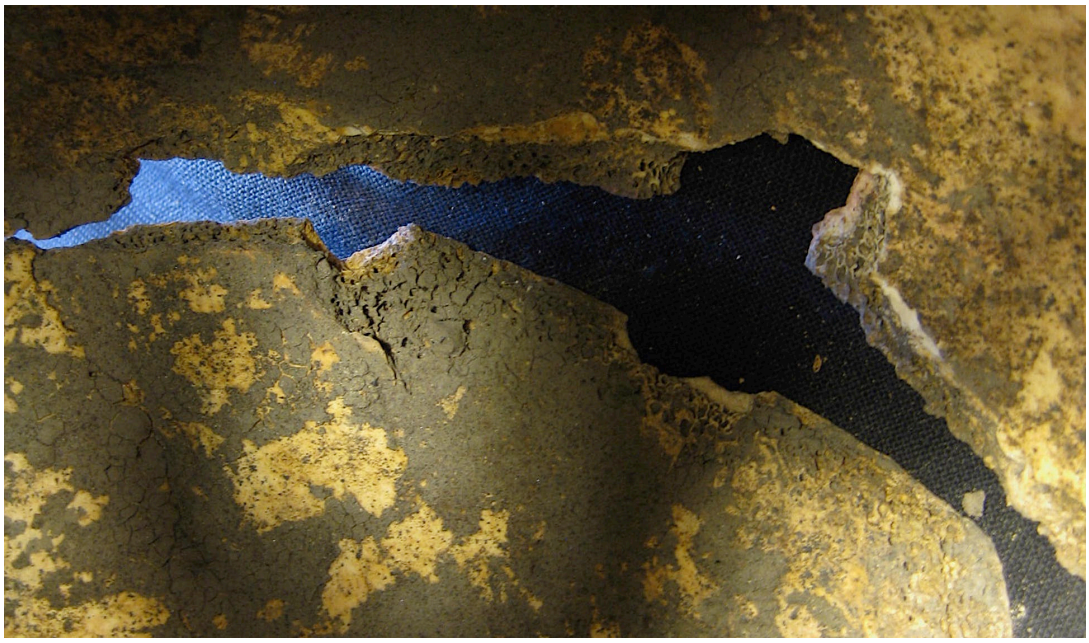
Figure 6.5a: Individual 5237, male aged 18-25, presenting with sharp force trauma.



The length of the injury suggests a long-bladed weapon (see Lewis, 2008). While the anterior margin of the injury is finite the posterior margin is not, possibly indicating that the blade may have been even larger than 200mm. The median blade length for knives analysed at the Museum of London was only 167mm (with a median of 157mm and a mode of 105mm). The median blade length for swords, on the other hand, was 675mm (with a minimum of 630mm and a maximum of 880mm). As the lesion fully penetrates the endocranium, the shape of the blade is uncertain, so it is not possible to fully rule out a curved blade such as that common to an axe. However, the average blade length for a medieval axe,

as calculated from seven axes curated at the Museum of London, was 160.29mm (with a median of 156mm and a mode of 180mm), which is smaller than the length of the sharp force injury present on this individual. This fact favours an interpretation of a sword causing the injury rather than an axe, but does not preclude it. One characteristic that may indicate that the injury was caused by an axe, instead of a sword, is the radiating fracture lines. These are seen more often in axe injuries as the blade acts like a wedge, splitting the skull open (Wenham, 1989: 132). The location of the injury and the characteristics of sharp force trauma indicate that this lesion is typical of violence. It is not diagnostic of violence since the possibility remains that he may have accidentally fallen on a long-bladed weapon, particularly as he may have been a butcher who handed sharp instruments regularly.

Figure 6.5b: Endocranial bevelling and consistent colouring of sharp force trauma on individual 5237 with some minor postmortem damage. (GPO75)



Puncture Trauma. Individual 5096, a male of undetermined age, presented with puncture trauma to the right parietal at the coronal suture (Figure 6.6a). There is bevelling to the inner table of the lesion and the outer table is depressed with

circular step-like rings descending down to the main point of impact (Figure 6.6b). There is consistent colouring throughout and there are no signs of healing, indicating that this wound occurred at or around the time of death.

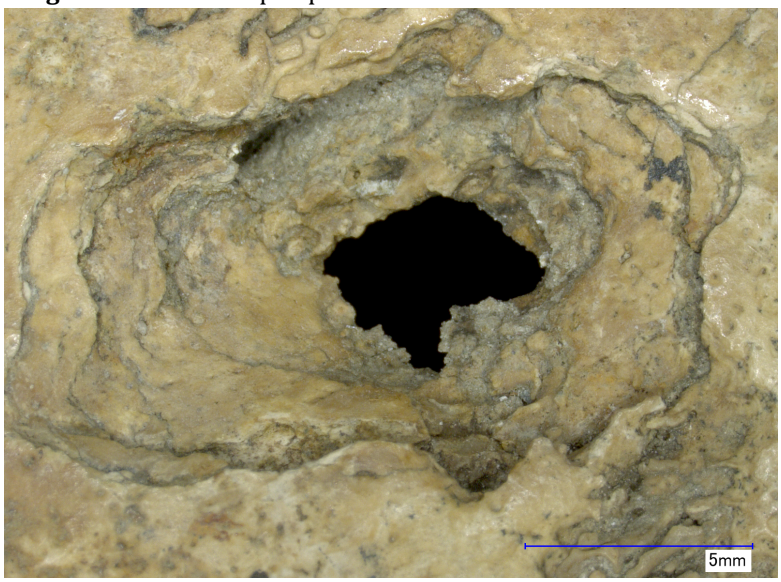
Figure 6.6a: Individual 5096, male of undermined age, with puncture trauma. (GPO75)



The directionality of the concentric radiating fractures, with the anterior margin steeper than the posterior margin, may indicate that the weapon struck the victim from behind at a downward angle. These concentric fractures are possibly indicative of a high velocity impact, such as that caused by a projectile. The injury is approximately 15mm in length and 10mm at its widest point, but only 3mm at its smallest. Due to the small size and shape of the lesion, an arrowhead, possibly a bodkin arrowhead due to its circular shape, may have caused it (Waller, 2000a:

135). A spearhead is another possibility, but during the 11th and 12th centuries, when this individual likely lived, spearheads, like most other arrowheads other than the bodkin, were primarily flat in shape (Swanton, 1973: 77, 115). The location of the injury and the fact that it was likely caused by an arrowhead or other projectile is typical of violence. It is not diagnostic of violence as it is possible he may have been accidentally shot. He is unlikely to have been accidentally (or intentionally) shot while working as a butcher (his most likely profession), but he would not have been immune from conscription. Therefore, participating in a battle or being the unfortunately victim of battle practice may be to blame for this injury. One other individual from this collection presented with puncture trauma, but is discussed below in the case study section.

Figure 6.6b: Close-up of puncture trauma from individual 5096.



6.1.2.1.1.2 Dental Trauma

Five individuals presented with dental fractures: one male, one female, and three adults of unknown sex (Table 6.5). All of the fractures were simple fractures to the enamel of the tooth. In none of the cases did the fracture affect the dentine or pulp of the tooth. There were no associated facial or cranial vault fractures,

meaning that they are unable to be fully linked to a violent aetiology and hence are only consistent with violence.

6.1.2.1.1.3 Case Study

Individual 5201, a probable male aged 26-35, presented with three lesions to the cranium. The largest lesion was the perimortem blunt force trauma to the right of the frontal bone, which measured 38mm in length and 44mm in width (Figure 6.7). The lesion exhibited endocranial bevelling, partial retention of bone along the margins, and two radiating fractures (one extending to the puncture trauma discussed below). There was also ectocranial bevelling at the anterior margin, possibly caused by the extraction of the weapon.

Figure 6.7: Individual 5201, male aged 26-35, with perimortem blunt force traumas, arrow points to second lesion. (GPO75)



There was a second, smaller, perimortem blunt force trauma just posterior to the first lesion (highlighted by the arrow in Figure 6.7). This one was non-

penetrating and formed a small depression in the bone, which measured 8mm in length and 7mm in width. If the individual's head was forward facing at the time of the attack, the weapon likely came from a frontal assault. Apart from likely being caused by a blunt force instrument, the specific weapon type could not be determined.

The third lesion was a puncture wound through the left parietal with the radiating fracture from the blunt force trauma connecting to it (see Figures 6.8 and 6.9). The lesion was 10mm in length and 9mm in width, which is a similar maximum width seen in individual 5096 (discussed above). The part of the endocranium that was dislodged from the projectile was still present and is seen in Figure 6.10. There are no indications of which direction the weapon may have struck from. The circular shape of the wound, as shown with individual 5096, may suggest a bodkin arrowhead. However, as there are no concentric or radiating fractures caused by the injury, it might indicate a lower velocity weapon, the type of which is uncertain.

The pattern of the wounds, particularly the fact that the radiating fracture from the blunt force trauma goes directly to the margins of the puncture lesion, suggests that this individual was hit over the head twice with a blunt object after they had already been shot or pierced with some sort of sharp weapon. In all, the locations, characteristics, and number of injuries are diagnostic of violence. While it is possible that he may have been a butcher and may have been susceptible to blunt force trauma through handling live animals, the number of injuries and the different weapons used, make this a highly unlikely scenario.

Figure 6.8: Individual 5201, male aged 26-35, with puncture trauma and radiating fracture lines. (GPO75)



Figure 6.9: Close-up of puncture trauma from individual 5201. (GPO75)

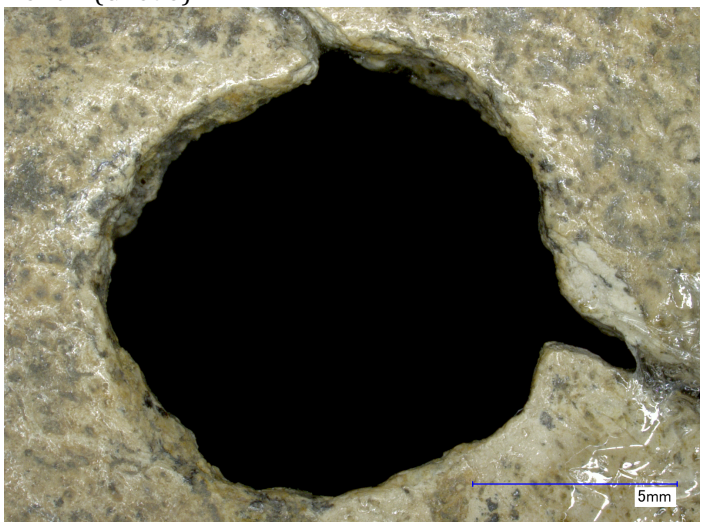
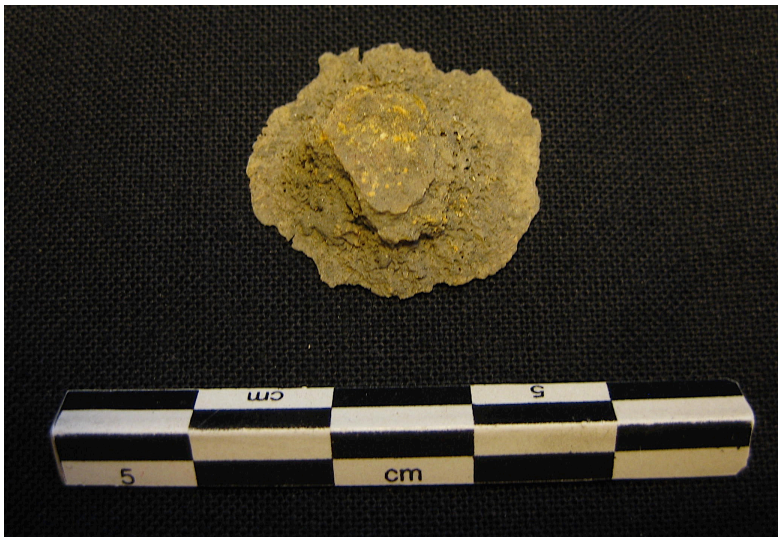


Figure 6.10: Endocranial plug from individual 5201. (GPO75)



6.1.2.1.2 Rib Fractures

Five individuals presented with at least one rib fracture (Table 6.5). Two of the individuals were female, one was male, and for the last two the sex could not be determined. In four cases only one rib was fractured, although in one instance the same rib was fractured in two places. In the last case (5258), two ribs were fractured but they were not adjacent, located on opposite sides of the body.

In total six ribs were fractured. Three presented with transverse fractures, one with an oblique fracture, one with a transverse and a greenstick fracture, and the last presented with sharp force trauma (discussed further below). Four of the fractures were on left ribs and two were found on right ribs. The individual (5258) that presented with two fractured ribs had one fracture on the right 6th rib and the other on the left 12th rib. As some of the individuals in this cemetery may have been butchers who worked with livestock, being kicked by livestock remains a possible scenario as to the cause of these rib fractures.

Individual 5141, a probable male aged older than 45, presented with perimortem puncture trauma to a left middle rib (Figure 6.11). The lesion is approximately 25mm in length and 3mm in width. It is about 20mm from the angle of the rib. Margins of the lesion on the anterior side of the rib are smooth with partial retention of bone fragments on the right side. The lesion penetrates to the interior side of the rib causing significant splintering of the bone. Some of the splintering appears to have been exacerbated postmortem. There are no signs of healing.

Figure 6.11: Individual 5141, a probable male aged older than 45, presented with sharp force trauma to a left middle rib. (GPO75)



The length and the very narrow width of the injury are suggestive of a small bladed weapon, such as that of a knife or dagger. The lesion is of a similar size and shape to medieval knives curated at the Museum of London, where, out of 23 blades analysed, the average blade width was 18.4mm (with a maximum of 30mm, a minimum of 9mm, and a mode of 25mm), and the average depth of the blade was 2.3mm (with a maximum of 4mm, a minimum of 1mm, and a mode of

2mm). These characteristics indicate that this lesion is typical of violence. As with the other bladed trauma noted above, butchery was a common profession at this site and it is possible that any bladed injuries may have been accidental.

6.1.2.1.3 Metacarpal Fractures

Five individuals presented with at least one fracture to a metacarpal (Table 6.5). Three of the individuals were male and two were female. All of the fractures were fully healed. Four were impact fractures, while the last was an avulsion fracture to the proximal epiphysis of the right first metacarpal (a Bennet's fracture). Both females had fractures to the left metacarpals. Two of the males had fractures to the right metacarpal and one to the left. These characteristics indicate that all may be considered consistent with violence.

6.2 ST LAWRENCE JEWRY (GYE92)

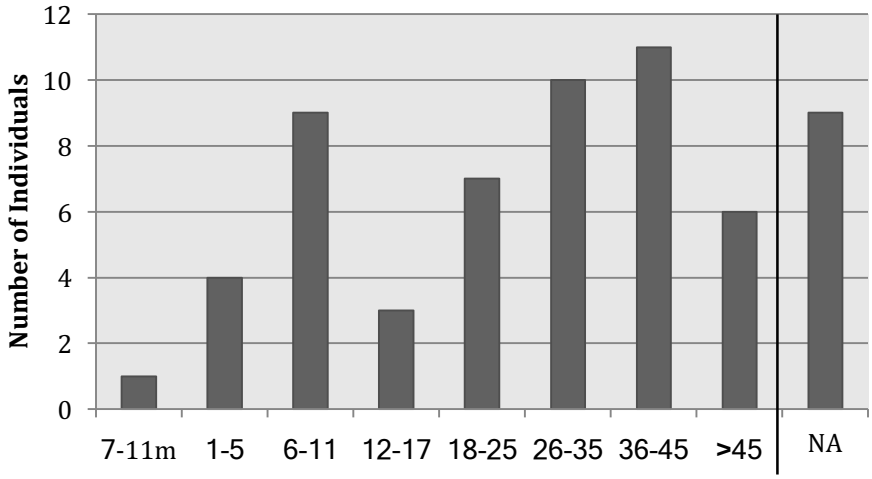
A total of 60 individuals were analysed from the St Lawrence Jewry (GYE92) collection. The majority (57) dated to between the 11th and early 13th centuries. Three dated to between the late 13th and middle 17th centuries. The sex ratio was 0.8:1, with slightly more females present in the collection than males (Table 6.6). Between age groups 12-17 and 36-45, the number of individuals increased with age (Figure 6.12). Age-at death peaked at 36-45 years and there was no discernible difference between males and females (Table 6.7). A much smaller percentage of adults (11.6%: 5/43) had an age-at-death estimated to be over 45 years. There were a high percentage of subadults, particularly between ages 6-

11, present in the collection. No subadults younger seven months were present at all.

Table 6.6: Number of Individuals by Sex (GYE92)

SEX	N	% OF TOTAL
Males	14	23.3%
Intermediates	2	3.3%
Females	18	30.0%
NA	9	15.0%
Subadults	17	28.3%
TOTAL	**60**	**100.0%**

Figure 6.12: Number of Individuals by Age Category (GYE92)



NA is the classification for adults whose age could not be determined

Table 6.7: Number of Adults by Sex and Age (GYE92)

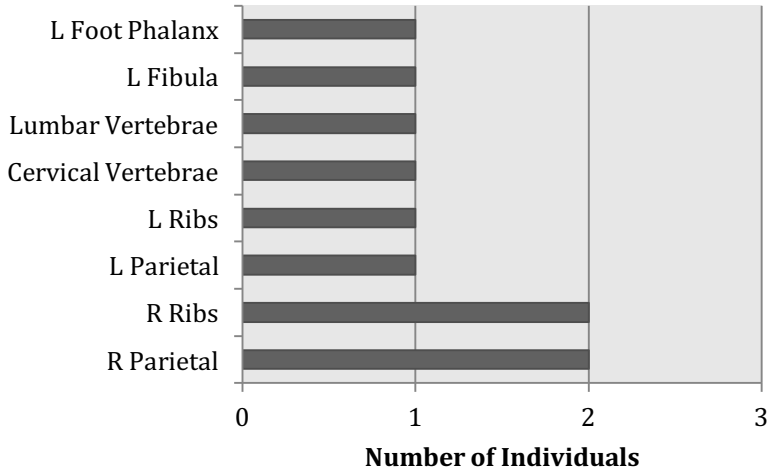
AGE	TOTAL	MALES		INTERMEDIATES		FEMALES		UNKNOWNS	
	N	N	%	N	%	N	%	N	%
18-25	7	4	57.1%	0	0.0%	3	42.9%	0	0.0%
26-35	10	4	40.0%	1	10.0%	5	50.0%	0	0.0%
36-45	11	4	36.4%	0	0.0%	6	54.5%	1	9.1%
>45	6	1	20.0%	0	0.0%	5	83.3%	0	0.0%
NA	10	1	10.0%	1	10.0%	0	0.0%	8	80.0%
TOTAL	**43**	**14**	**32.6%**	**2**	**4.7%**	**18**	**41.9%**	**9**	**20.9%**

6.2.1 TRAUMA

In the St Lawrence Jewry (GYE92) collection eight individuals presented with at least one fracture, representing 13.3% (8/60) of the total population. Between the eight individuals there were a total of 10 fractures. Two individuals, both

male, had two fractures each and the other six all had one each. Three of the eleven fractures were located on the skull, three were located on the ribs, two were located on the vertebrae, and one was located on the fibula. A full distribution of fracture by location is shown in Figure 6.13. No dislocations or soft tissue traumas were observed.

Figure 6.13: Number of Individuals with Fractures by Location (GYE92)



Males displayed the highest crude prevalence of fractures with 35.7% (5/14) of the male population affected. Females had a crude prevalence of 11.1% (2/18). No subadults of any age presented with a fracture. One out of the two individuals that were scored as having an intermediate sex presented with a fracture, but no adults of undetermined sex did. There was no statistically significant difference between the males and females presenting with fracture trauma. There was also no statistically significant difference in the crude prevalence of fractures between the adults and subadults. Table 6.8 shows the full distribution of fractures by sex.

Table 6.8: Crude Prevalence of All Fractures by Sex and Age (GYE92)

AGE	MALES			INTERMEDIATES			FEMALES			UNKNOWNS			SUBADULTS			TOTAL		
	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%
Perinatal	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
1-6m	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
7-11m	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0.0%	**1**	**0**	**0.0%**
1-5	-	-	-	-	-	-	-	-	-	-	-	-	4	0	0.0%	**4**	**0**	**0.0%**
6-11	-	-	-	-	-	-	-	-	-	-	-	-	9	0	0.0%	**9**	**0**	**0.0%**
12-17	-	-	-	-	-	-	-	-	-	-	-	-	3	0	0.0%	**3**	**0**	**0.0%**
18-25	4	0	0.0%	0	0	0.0%	3	0	0.0%	0	0	0.0%	-	-	-	**7**	**0**	**0.0%**
26-35	4	1	25.0%	1	1	100.0%	5	1	20.0%	0	0	0.0%	-	-	-	**10**	**3**	**30.0%**
36-45	4	3	75.0%	0	0	0.0%	5	0	0.0%	2	0	0.0%	-	-	-	**11**	**3**	**27.3%**
>45	1	1	100.0%	0	0	0.0%	5	1	20.0%	0	0	0.0%	-	-	-	**6**	**2**	**33.3%**
NA	1	0	0.0%	1	0	0.0%	0	0	0.0%	7	0	0.0%	-	-	-	**9**	**0**	**0.0%**
SA NA	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
TOTAL	**14**	**5**	**35.7%**	**2**	**1**	**50.0%**	**18**	**2**	**11.1%**	**9**	**0**	**0.0%**	**17**	**0**	**0.0%**	**60**	**8**	**13.3%**

Table 6.9: Crude Prevalence of VRI by Sex and Age (GYE92)

AGE	MALES			INTERMEDIATES			FEMALES			UNKNOWNS			SUBADULTS			TOTAL		
	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%
Perinatal	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
1-6m	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
7-11m	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0.0%	**1**	**0**	**0.0%**
1-5	-	-	-	-	-	-	-	-	-	-	-	-	4	0	0.0%	**4**	**0**	**0.0%**
6-11	-	-	-	-	-	-	-	-	-	-	-	-	9	0	0.0%	**9**	**0**	**0.0%**
12-17	-	-	-	-	-	-	-	-	-	-	-	-	3	0	0.0%	**3**	**0**	**0.0%**
18-25	4	0	0.0%	0	0	0.0%	3	0	0.0%	0	0	0.0%	-	-	-	**7**	**0**	**0.0%**
26-35	4	1	25.0%	1	0	0.0%	5	0	0.0%	0	0	0.0%	-	-	-	**10**	**1**	**10.0%**
36-45	4	2	50.0%	0	0	0.0%	5	0	0.0%	2	0	0.0%	-	-	-	**11**	**2**	**18.2%**
>45	1	1	100.0%	0	0	0.0%	5	1	20.0%	0	0	0.0%	-	-	-	**6**	**2**	**40.0%**
NA	1	0	0.0%	1	0	0.0%	0	0	0.0%	7	0	0.0%	-	-	-	**9**	**0**	**0.0%**
SA NA	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
TOTAL	**14**	**4**	**28.6%**	**2**	**0**	**0.0%**	**18**	**1**	**5.6%**	**9**	**0**	**0.0%**	**17**	**0**	**0.0%**	**60**	**5**	**8.3%**

The oldest group in the population, those >45, had the highest proportion of fractures with 33.3% (2/6) presenting with fracture trauma. They were followed by adults aged 26-35 and 36-45 with 30.0% (3/10) and 27.3% (3/11) affected respectively. No one under the age of 26, including subadults, presented with any fractures. There appears to be a general pattern of accumulation of fractures with age, but there were no statistically significant differences between the age groups. Table 6.8 shows the full distribution of fractures by age category.

6.2.1.1 VIOLENCE-RELATED INJURIES

Five of the eight fractured individuals presented with trauma to locations that are potentially indicative of violence. They represented 8.3% (5/60) of the total population (Table 6.9). There was a total of seven fractures between these five individuals. Two of the five individuals had two fractures each and the remaining three presented with one fracture each. Of the individuals with multiple fractures, one individual had two fractures to two separate, unsided, ribs, and the other individual had one fracture to the right 2nd rib and the other to the L5 spinous process. The right parietal was the most effected with a true prevalence of 5.4% (2/37). The left parietal had a true prevalence of 2.8% (1/36) and the ribs had a true prevalence of 0.3% (3/1092). All VRI were fully healed, indicating the affected individuals survived well after the incident that caused the injury. All individuals affected were dated to between 1050 and 1140, except for one (10734) who dated to between 1140 and 1230. A complete list of individuals presenting with VRI is shown in Table 6.10.

Table 6.10: Individuals with Possible VRI (GYE92)

Context #	Sex	Age	# of Fractures	Location	Notes
10734	M	36-45	1	Right parietal	BFT - penetrating to the endocranium
17166	M	>46	2	2 fractured ribs – one left, one right	Both transverse
20105	M	36-45	1	Right frontal; right parietal	SFT - penetrating to the endocranium
20538	M	26-35	2	Right upper rib; L5 spinous process	Transverse
20574	F?	>46	1	Left parietal (sagittal suture)	Penetrating to the endocranium; possible trepanation (surgery)

Males had the largest crude prevalence of VRI with 28.6% (4/14) affected. Only one female was affected by a VRI, representing 5.6% (1/18) of all females. No intermediate adults or adults of undetermined sex presented with fractures, violence related or otherwise. The same is true of subadults. There were no statistically significant differences between the sexes. Table 6.5 shows the full distribution of VRI by sex. The adults appear to show an accumulation of violence-related trauma with age, which is to be expected. But, there were also no statistically significant differences between the different age categories. Table 6.9 shows the full distribution of VRI by age.

6.2.1.1.1 Skull Trauma

Three out of the five individuals with possible VRI had fractures to the cranial vault. Two were male and the other a probable female (Table 6.10). All individuals only presented with one fracture each. One individual had trauma indicative of blunt force trauma, another had sharp force trauma, while the last presented with a puncture injury. There were no individuals with fractures to the facial region or dentition.

Blunt Force Trauma. Individual 10734, a male aged 36-45 and dated to 1140-1230, presented with a healed depression fracture to the right parietal, above the hat-brim line. The wound is approximately 30mm from the lambdoidal suture and extends over the sagittal suture. It measures 12mm in length and 14mm in width. There was severe postmortem damage to the endocranium, but it appears that the injury healed imperfectly leaving a penetrating hole through the width of the cranium. There are signs of healed periostitis on the area of the endocranium surrounding the injury. Overall, due to its size, shape, and location, this lesion is highly consistent with violence. There remains the possibility that this was an accidental injury, particularly as he may have worked in a profession that often used heavy, blunt instruments such as metalworking. Although, modern cases of metalworking blunt force trauma predominately affect the extremities (Saha *et al.*, 2007).

Sharp Force Trauma. One individual, a male aged 36-45 (20105) and dated to 1050-1140, had an injury indicative of sharp force trauma. He presented with one lesion extending from the right frontal across to the right parietal with a well-healed radiating fracture across the left parietal. The main lesion penetrated the endocranium even though it was fully healed (shown in Figure 6.14 – the radiating fractures seen in the picture are postmortem). Due to the size of the lesion and the fact that it penetrated the endocranium it is remarkable that this individual survived and suggests that he might have received some sort of medical care. There are signs of a healed infection on the endocranium.

Figure 6.14: Individual 20105, a male aged 36-45, presenting with large, fully healed sharp force injury across the top of the cranial vault. (GYE92)



The lesion measured 50mm in length and 19mm at its greatest width. The depth of the wound is greater at the anterior margin than the posterior, but the deepest part of the injury is in the middle of the lesion at the coronal suture. Here, the lesion fully penetrates the endocranium. This pattern is suggestive of a curved blade, such as that of an axe (see Wenham, 1989: 132). The radiating fracture line further strengthens this interpretation (ibid). While the average blade length of medieval axes measured at the Museum of London was 160.29mm, the anterior and posterior margins do not appear to be finite, potentially indicating that the blade was longer than the length of the lesion. The larger, more acute wall of the callus on the left margin, the obtuse angle of the callus on the right margin, and the slighter deeper cranial penetration seen on the anterior margin, compared to the posterior one, suggests that the blade likely struck this individual from the front (if the individual's head was facing

forward at the time of the event) and was slightly angled to the left of the victim. The location and size of the injury suggests that this injury is typical of violence. The only other possible scenario is that he was accidental struck by a curved bladed weapon. Of the possible occupations that are likely to be represented amongst the St Lawrence Jewry collection, none are known to have consistently used such weapons in their work, but axes can be common household items, so an accidental aetiology remains a possibility.

Puncture Trauma. A probable female, aged older than 45, dating to 1050-1140, presented with a puncture trauma that extended from the bregma down across the sagittal suture (Figure 6.15). It was 27mm in length and, though well-healed, it displayed signs of potential surgery with healed scrape marks around the margins of the lesion. It measured 10mm at its widest point and only 4mm at its narrowest. Due to the location of the trauma and the evidence of surgery, it is possible that this is the result of a trepanation. However, most trepanations are round in shape and the slit-like shape of this injury might suggest a puncture by a bladed weapon with subsequent surgery. There was evidence of a well-healed infection around the margins of the wound.

The length of the wound is similar to the modal width of medieval knife blades measured at the Museum of London, which was 25mm (the mean width was 18.43mm and the median width was 17mm). In contrast, the mean width of sword blades was 46mm (with a minimum of 37mm and a maximum of 55mm). This difference perhaps indicates that a flat-bladed knife is more likely to have caused this injury than a sword. However, this seems like an unlikely location for

Figure 6.15: Individual 20574, a probable female aged older than 45, presenting with a puncture trauma to the top of the cranial vault with evidence of surgery. (GYE92)



a stab wound from a knife. As such, this injury is highly consistent with violence, but other scenarios should also be considered a possibility. As a woman in a middling to middling-high status cemetery, it is unlikely that she would have participated in particularly strenuous labour. She mainly would have run the household and may have helped her husband in his occupation on occasion

(Jewell, 1996). What risks she may have been exposed to that would have caused such an injury is unknown.

6.2.1.1.2 Rib Fractures

Two individuals, both dated to 1050-1140, presented with rib fractures (Table 6.10). One male aged >45 (17166) had two fractures to two separate ribs, one to a left middle rib and the other to a right middle rib. The left rib had a simple, fully-healed transverse fracture near the sternal end of the rib with no misalignment or other complications. The right rib also had a fully-healed transverse fracture, but located at the angle with slight dorsal rotation. Another male, aged 26-35 (20538) presented with a well-healed transverse fracture to a right upper rib. He also presented with a healed fracture to the spinous process of the fifth lumbar vertebrae. The fracture type and location of these rib fractures is consistent with violence, but other scenarios are also likely particularly for individuals who may have worked in occupations that required handling of heavy equipment, such as metalworking.

6.3 SPITAL SQUARE (NRT85)

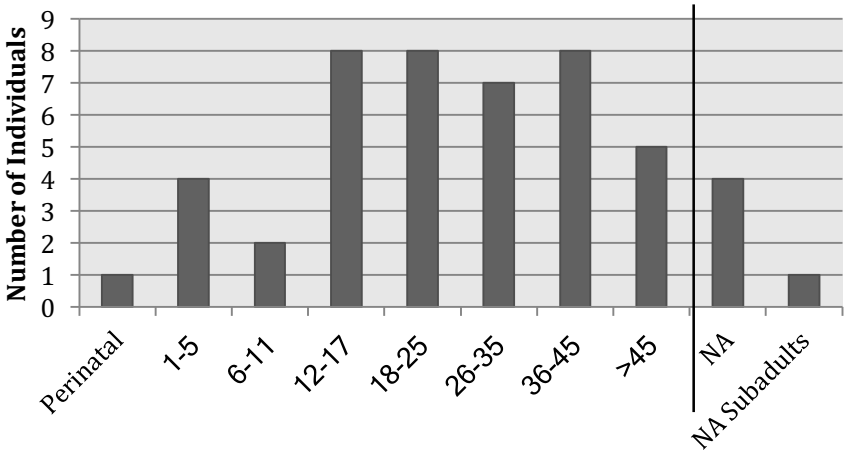
A total of 101 skeletons were exhumed from the Spital Square (NRT85) site but, because of poor preservation, only 48 individuals were analysed in this study. This was mainly due to the fact that the construction of the infirmary extension on top of the cemetery truncated many of the skeletons. All the skeletons date to between 1197 and 1280. The sex ratio was 2.9:1, with more males present than females (Table 6.11). There was no distinct pattern between the number of

individuals in the collection and the age-at-death (Figure 6.16). However, over half[51] (60.5%) of the individuals died before the age of 25. For those that reached adulthood, male age-at-death peaked at the 36-45 age group, whereas the female age-at-death did not peak until >45. The overall numbers are low, however, making this a dubious trend (Table 6.12).

Table 6.11: Number of Individuals by Sex (NRT85)

SEX	N	% OF TOTAL
Males	20	41.7%
Intermediates	2	4.2%
Females	7	14.6%
NA	3	6.3%
Subadults	16	33.3%
TOTAL	**48**	**100.0%**

Figure 6.16: Number of Individuals by Age (NRT85)



NA and NA Subadult are the classifications for adults and subadults whose age could not be determined

Table 6.12: Number of Adults by Sex and Age (NRT85)

AGE	TOTAL	MALES		INTERMEDIATES		FEMALES		UNKNOWNS	
	N	N	%	N	%	N	%	N	%
18-25	8	7	87.5%	1	12.5%	0	0.0%	0	0.0%
26-35	7	3	42.9%	1	14.3%	2	28.6%	1	14.3%
36-45	8	7	87.5%	0	0.0%	1	12.5%	0	0.0%
>45	5	1	20.0%	0	0.0%	4	80.0%	0	0.0%
NA	4	1	25.0%	0	0.0%	0	0.0%	3	75.0%
TOTAL	**32**	**19**	**59.4%**	**2**	**6.3%**	**7**	**21.9%**	**4**	**12.5%**

[51] When adults of unknown age are excluded.

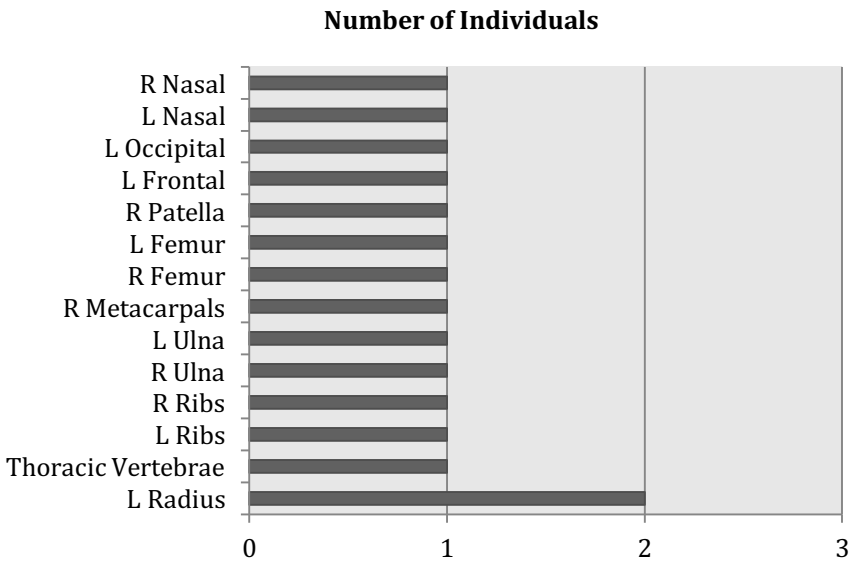
6.3.1 TRAUMA

In the Spital Square (NRT85) collection, eight individuals presented with at least one fracture, representing 16.7% (8/48) of the total population. There was a total of 15 fractures between those eight individuals. All were fully healed. Four individuals presented with two or more fractures. One female, aged >45 (19), presented with five fractures: one each to the left ulna, right ulna, right radius, right fifth metacarpal, and nasal. Another individual, a male aged 18-25 (298), presented with three fractures: one each to the right femur, right patella, and left occipital. The last two individuals with multiple fractures were a probable female, aged >45 (22), who presented with a fracture to the left femur and right 2nd rib, and a male, aged 18-25 (339), who presented with a fracture to the left 2nd rib and the acromion process of the left scapula. The other four individuals presented with one fracture each in various locations. There was only one location that had more than one fracture and that was the left radius. A full list of the fracture locations is shown in Figure 6.17. No dislocations were observed and only one *myositis ossificans traumatica* was observed, which is discussed further below in the section on skull trauma.

In terms of fracture crude prevalence by sex, females had the largest proportion of affected individuals, with 42.9% (3/7) presenting with at least one fracture. Males presented with a crude prevalence of 20.0% (4/20), while one subadult was affected by bone fracture, representing 6.3% (1/16) of the subadult population. Despite the much higher proportion of females presenting with fractures than males, the difference is not statistically significant, most likely due to the fact that the total numbers are quite low. There was also no statistically

significant difference between the proportion of adults presenting with fractures and subadults presenting with fractures. Table 6.13 shows the full distribution of fractures between the sexes.

Figure 6.17: Number of Individuals with Fractures by Location (NRT85)



Adults aged >45 displayed the highest proportion of fractures with 60.0% (3/5) of individuals affected. All were female. They were followed by adults aged 26-35 with 28.6% (2/7), then adults aged 18-25 with 25.0% (2/8), and then finally subadults aged 12-17 with 12.5% (1/8) presenting with at least one fracture. No adults aged 36-45 or adults of undetermined age presented with fractures. There were also no subadults under 12 affected by trauma. Omitting the anomalous 36-45 age group, there appears to be an accumulation of fractures with age. However, no statistically significant difference between the age categories in relation to the crude prevalence of fractures was found. Table 6.13 shows the full distribution of fractures across the different age categories.

Table 6.13: Crude Prevalence of All Fractures by Sex and Age (NRT85)

	MALES			INTERMEDIATES			FEMALES			UNKNOWNS			SUBADULTS			TOTAL		
AGE	**N**	**AFF**	**%**	**N**	**AFF**	**%**	**N**	**AFF**	**%**	**N**	**AFF**	**%**	**N**	**AFF**	**%**	**N**	**AFF**	**%**
Perinatal	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0.0%	**1**	**0**	**0.0%**
1-6m	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
7-11m	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
1-5	-	-	-	-	-	-	-	-	-	-	-	-	4	0	0.0%	**4**	**0**	**0.0%**
6-11	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0.0%	**2**	**0**	**0.0%**
12-17	-	-	-	-	-	-	-	-	-	-	-	-	8	1	12.5%	**8**	**1**	**12.5%**
18-25	7	2	28.6%	1	0	0.0%	0	0	0.0%	0	0	0.0%	-	-	-	**8**	**2**	**25.0%**
26-35	4	2	50.0%	1	0	0.0%	2	0	0.0%	0	0	0.0%	-	-	-	**7**	**2**	**28.6%**
36-45	7	0	0.0%	0	0	0.0%	1	0	0.0%	0	0	0.0%	-	-	-	**8**	**0**	**0.0%**
>45	1	0	0.0%	0	0	0.0%	4	3	75.0%	0	0	0.0%	-	-	-	**5**	**3**	**60.0%**
NA	1	0	0.0%	0	0	0.0%	0	0	0.0%	3	0	0.0%	-	-	-	**4**	**0**	**0.0%**
SA NA	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0.0%	**1**	**0**	**0.0%**
TOTAL	**20**	**4**	**20.0%**	**2**	**0**	**0.0%**	**7**	**3**	**42.9%**	**3**	**0**	**0.0%**	**16**	**1**	**6.3%**	**48**	**8**	**16.7%**

Table 6.14: Crude Prevalence of VRI by Sex and Age (NRT85)

AGE	MALES			INTERMEDIATES			FEMALES			UNKNOWNS			SUBADULTS			TOTAL		
	N	**AFF**	**%**	**N**	**AFF**	**%**	**N**	**AFF**	**%**	**N**	**AFF**	**%**	**N**	**AFF**	**%**	**N**	**AFF**	**%**
Perinatal	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0.0%	**1**	**0**	**0.0%**
1-6m	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
7-11m	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
1-5	-	-	-	-	-	-	-	-	-	-	-	-	4	0	0.0%	**4**	**0**	**0.0%**
6-11	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0.0%	**2**	**0**	**0.0%**
12-17	-	-	-	-	-	-	-	-	-	-	-	-	8	1	12.5%	**8**	**1**	**12.5%**
18-25	7	2	28.6%	1	0	0.0%	0	0	0.0%	0	0	0.0%	-	-	-	**8**	**2**	**25.0%**
26-35	4	1	25.0%	1	0	0.0%	2	0	0.0%	0	0	0.0%	-	-	-	**7**	**1**	**14.3%**
36-45	7	0	0.0%	0	0	0.0%	1	0	0.0%	0	0	0.0%	-	-	-	**8**	**0**	**0.0%**
>45	1	0	0.0%	0	0	0.0%	4	2	50.0%	0	0	0.0%	-	-	-	**5**	**2**	**40.0%**
NA	1	0	0.0%	0	0	0.0%	0	0	0.0%	3	0	0.0%	-	-	-	**4**	**0**	**0.0%**
SA NA	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0.0%	**1**	**0**	**0.0%**
TOTAL	**20**	**3**	**15.0%**	**2**	**0**	**0.0%**	**7**	**2**	**28.6%**	**3**	**0**	**0.0%**	**16**	**1**	**6.3%**	**48**	**6**	**12.5%**

5.3.1.1 VIOLENCE-RELATED INJURIES

Six out of the eight individuals with bone fractures, presented with possible violence-related trauma, representing 12.5% (6/48) of the total population (Table 5.14). Three were male, two were female, and one was a subadult. There was a total of 13 fractures between those six individuals. Four individuals had two or more fractures and the other two had one fracture each. One female, aged >45 (19), had five fractures: one each to the left ulna, right ulna, left radius, right metacarpal, and right nasal. Of the other three individuals with multiple fractures, one was a male, aged 18-25 (22), with a transverse fracture to the left second rib and a transverse fracture to the acromion process of the left scapula. Another was a male, aged 18-25 (298), with a fractured right femur, right patella, and depression fracture to the left occipital. The last individual was a probable female, aged >46 (339), who had a fractured left femur and right upper rib. These last two individuals presented with a fractured femur, suggesting that their fractures may have been caused by an accidental event, instead of a violent one. Table 6.15 provides a full list of individuals with possible VRI.

Table 6.15: Individuals with Possible VRI (NRT95)

Context #	Sex	Age	# of Fractures	Location	Notes
19	F	>46	4	Right ulna; left radius; right 5th metacarpal; right nasal	Colles' fracture – left radius; transverse – right ulna; impaction – metacarpal; transverse - nasal
22	M	18-25	2	Left 2nd rib; L acromion process	Transverse?
148	M?	26-35	1	Left nasal	
298	M	18-25	3	Right femur; right patella; left occipital	Differential diagnosis: soft tissue trauma (occipital)
339	F?	>46	2	Right upper rib; left femur	Rib - Transverse
367	NA	SA 12-17	1	Left frontal	Blunt force trauma - collapse of frontal sinus

In terms of trauma location, three individuals had fractures to the skull, two had fractures to the ribs, and one had a fractured metacarpal. The nasal was the most affected location in relation to overall true prevalence with 5.3% (2/38) presenting with a fracture. The occipital was the next most affected bone with a true prevalence of 2.9% (1/35). The left frontal was similarly affected with 2.6% (1/38). The right metacarpal had a true prevalence of 0.6% (1/170). Both left and rib ribs had a true prevalence of 0.2% (1/425 and 1/417, respectively). All fractures were well healed with only minor complications.

As with all fractures, females presented with the highest crude prevalence of violence related trauma, representing 28.6% (2/7) of the total female population. Fifteen per cent of males (3/20) were affected by possible VRI, while only one subadult was affected, representing 6.2% (1/16) of the subadult population. There were no statistically significant differences between the males and females or between the adults and the subadults. The small number of total individuals, as well as those affected by violent trauma, makes it hard for any patterns or statistical differences to be discerned. Table 6.14 shows the full distribution of fractures by sex.

Individuals in the oldest age category, >45, presented with the highest proportion of possible VRI and represented 40.0% (2/5) of the total. Adults aged 18-25 reported the next highest with 25.0% (2/8) presenting with possible VRI. They were followed by adults aged 26-45 with 14.3% (1/7) represented and then subadults aged 12-17 with 12.5% (1/8). No adults aged 36-45 or adults of undetermined age presented with possible VRI. No subadults under the age of 12

were affected by VRI either. There was no statistically significant difference between the various age groups. Table 6.14 shows the full distribution of fractures by age category. As this site includes individuals from the early infirmary cemetery who are likely to have been quite poor, risk of injury, both accidental and intentional may have been quite high (see Section 4.3.1.2).

6.3.1.1.1 Skull Trauma

Four individuals presented with trauma to the skull (Table 6.15). Two were male, one was female and the last a subadult. Two of the injuries were located on the cranial vault, while the other two were to the nasal bones. No fractures affected the dentition.

6.3.1.1.1.1 Cranial Vault Trauma

Both individuals with trauma to the cranial vault were potentially indicative of blunt force trauma. One was a male, aged 18-25, and the other was a subadult, aged 12-17. The adult presented with trauma to the left side of the occipital, while the subadult presented with an injury to the left side of the frontal bone. Specifically, the subadult, aged 12-17 (367), presented with a depressed fracture to the left frontal that led to the collapse of the frontal sinus cavity. The lesion was well healed and measured 10mm in length and 5mm in width. Due to the age of the individual (closer to 12 than 17) and the location of the injury only slightly above the hat brim line, it is possible that an accidental, rather than violent, event, caused this lesion meaning that the injury is only consistent with violence.

A male, aged 18-25 (298), presented with a smooth, rounded bone growth near the nuchal line of the occipital (Figure 6.18). It measures 17mm in length, 8mm wide and is located approximately 20mm from the foramen magnum, right next to the lambdoidal suture. The origin of this exotosis is uncertain. But, due to its location near the attachment of the *rectus capitis posterior major* and *obliquus capitis superior* muscles, it is possible that this is a form of soft tissue trauma either from a severely torn muscle or blunt force trauma. As such, the injury is consistent with violence, but other scenarios are likely.

Figure 6.18: Individual 298, a male aged 18-25, with bone growth possibly caused by soft tissue trauma? (NRT85)



6.3.1.1.1.2 Facial Trauma

A male, aged 26-35 (148), presented with a fracture to the left nasal bone. The fracture is fully healed and only displays a slight medial angulation. No other fractures were discovered on this individual, so this injury is consistent with violence.

A female, aged older than 45 (19), presented with a fracture to the right nasal bone. The injury was fully healed but part of the fracture, across the nasal bridge, remained ununited. This individual also presented with four other fractures and presents a rather interesting case study. The Colles' and greenstick fractures to the left radius and ulna respectively are common injuries resulting from a fall. However, the injuries to the right arm: a transverse fracture to the distal third of the ulna, indicative of a parry fracture, and an impacted fracture to the fifth metacarpal suggest a violent encounter, in which the individual both defended herself from a blow as well as fought back with her fists. The nasal fracture supports this theory. Whether the fall that resulted in the fractures to the left hand happened while experiencing this violent encounter is uncertain as all the injuries are fully healed and thus, the timing of the injuries is unable to be assessed. The overall number of fractures and their characteristics are highly consistent with violence.

6.3.1.1.2 Rib Fractures

Two individuals presented with rib fractures (Table 6.15). One, a probable female aged >45 (339), presented with a transverse fracture to a right upper rib, located approximately 40mm from the sternal end. The fracture was well-healed with only a small amount of callus formation. This woman also had an oblique fracture to the left femur that healed with medial angulation and dorsal rotation. There was a large amount of healed periostitis around the injury. As both injuries were fully healed, whether they occurred separately or as a result of the same event is impossible to determine. Thus, due to the combination of injuries it is possible that both fractures were due to one accidental event and the

transverse rib fracture is only consistent with violence. The other individual with a rib fracture was a male aged 18-25 (22) with a transverse fracture to the left 2nd rib. The fracture was well-healed with no complications beside minor callus formation. Since there are no other VRIs present, this injury is only consistent with violence.

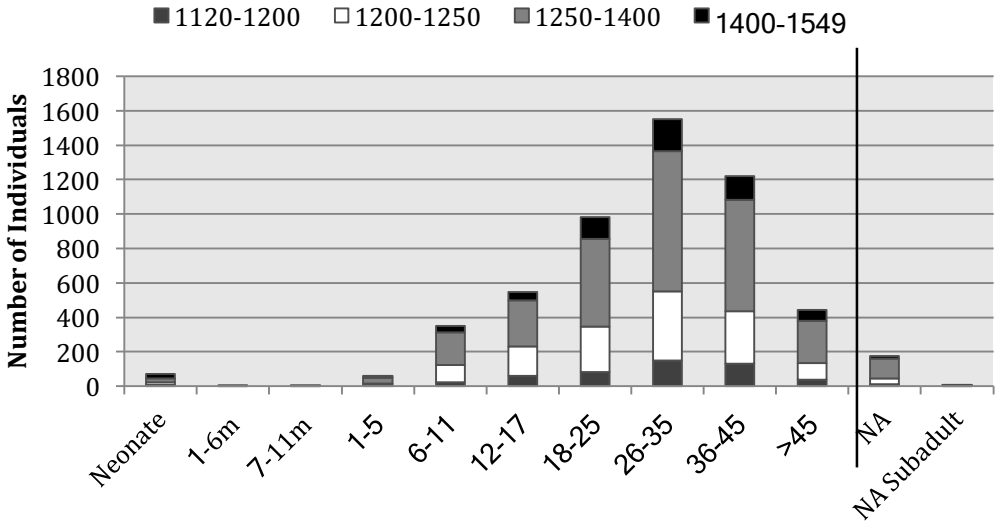
6.4 ST MARY SPITAL (SRP98)

In total, 10,516 individuals were recovered from the priory buildings and attached churchyard of St Mary Spital (SRP98). A total of 5,400 complete skeletons were used for analysis. The sex ratio for the whole skeletal population was 1.2:1 and varied very little between the different time periods: 1120-1200 = 1.3:1; 1200-1250 = 1.1:1; 1250-1400 = 1.2:1; 1400-1549 = 1.4:1 (Table 6.16). The number of individuals increased with age until age-at-death peaked at the 26-35 age group (Figure 6.19). This is earlier than would be expected based on other age profiles from the other London collections, which peak at 36-45. This pattern was consistent between the different time periods. There was not a large subadult population represented in the collection, particularly those under the age of six. This was the only collection not personally analysed by the author. As such the results that follow are more general and quantitative than the rest of the results presented in this chapter.

Table 6.16: Number of Individuals by Sex and Time Period (SRP98)

SEX	1120-1200		1200-1250		1250-1400		1400-1549		TOTAL	
CATEGORY	N	%	N	%	N	%	N	%	N	%
Males	222	43.5%	532	38.1%	1194	42.0%	290	44.7%	2238	41.4%
Intermediates	21	4.1%	46	3.3%	110	3.9%	28	4.3%	205	3.8%
Females	169	33.1%	506	36.2%	1012	35.6%	202	31.1%	1889	35.0%
NA	4	0.8%	10	0.7%	16	0.6%	5	0.8%	35	0.6%
Subadults	94	18.4%	304	21.7%	510	17.9%	125	19.2%	1033	19.1%
TOTAL	**510**	**100.0%**	**1398**	**100.0%**	**2842**	**100.0%**	**650**	**100.0%**	**5400**	**100.0%**

Figure 6.19: Number of Individuals by Age Group and Time Period (SRP98)



NA and NA Subadult are the classifications for adults and subadults whose age could not be determined

5.4.1 TRAUMA

In the main cemetery of the St Mary Spital (SRP98) precinct, 20.9% (1130/5400) of individuals presented with at least one fracture (Table 6.17). The crude percentage of fractures increased with age ($\chi^2 = 354.95$, df = 5, $p < 0.001$, $\Phi_c = 0.26$) and there was a statistically significant difference between males and females ($\chi^2 = 53.34$, df = 1, $p < 0.001$, $\Phi_c = 0.11$). Only 3.2% (33/1033) of subadults presented with a fracture and no subadults younger than six were affected.

There were ten individuals who presented with possible dislocations. Five were male and five were female. Two were due to congenital hip dysplasia and the rest affected the shoulder, wrist, or hand, all of which are most indicative of falls. Only one person presented with a confirmed soft tissue trauma. The individual was a male, aged 18-25 (30138), who presented with a bony protrusion on the distal

Table 6.17: Crude Prevalence of Fracture by Age and Sex (SRP98)

AGE	MALES			INTERMEDIATES			FEMALES			UNKNOWNS			SUBADULTS			TOTAL		
(YEARS)	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%
Perinatal	-	-	-	-	-	-	-	-	-	-	-	-	70	0	0.0%	**70**	**0**	**0.0%**
1-6m	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0.0%	**2**	**0**	**0.0%**
7-11m	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0.0%	**2**	**0**	**0.0%**
1-5	-	-	-	-	-	-	-	-	-	-	-	-	58	0	0.0%	**58**	**0**	**0.0%**
6-11	-	-	-	-	-	-	-	-	-	-	-	-	349	7	2.0%	**349**	**7**	**2.0%**
12-17	-	-	-	-	-	-	-	-	-	-	-	-	547	26	4.8%	**547**	**26**	**4.8%**
18-25	482	86	17.8%	62	6	9.7%	429	32	7.5%	8	0	22.2%	-	-	-	**981**	**124**	**12.6%**
26-35	753	218	29.0%	69	10	14.5%	719	156	21.7%	9	2	50.0%	-	-	-	**1550**	**386**	**24.9%**
36-45	700	266	38.0%	48	13	27.1%	468	120	25.6%	4	2	0.0%	-	-	-	**1220**	**401**	**32.9%**
>45	222	82	36.9%	7	3	42.9%	211	61	28.9%	2	0	23.0%	-	-	-	**442**	**146**	**33.0%**
ADULT	81	22	27.2%	19	3	15.8%	62	11	17.7%	12	3	0.0%	-	-	-	**174**	**39**	**22.4%**
SUBADULT	-	-	-	-	-	-	-	-	-	-	-	-	5	0	0.0%	**5**	**0**	**0.0%**
TOTAL	**2238**	**674**	**30.1%**	**205**	**35**	**17.1%**	**1889**	**380**	**20.1%**	**35**	**7**	**20.0%**	**1033**	**33**	**3.2%**	**5400**	**1129**	**20.9%**

Table 6.18: Crude Prevalence of VRI by Age and Sex (SRP98)

AGE	MALES			INTERMEDIATES			FEMALES			UNKNOWNS			SUBADULTS			TOTAL		
(YEARS)	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%
Perinatal	-	-	-	-	-	-	-	-	-	-	-	-	70	0	0.0%	**70**	**0**	**0.0%**
1-6m	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0.0%	**2**	**0**	**0.0%**
7-11m	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0.0%	**2**	**0**	**0.0%**
1-5	-	-	-	-	-	-	-	-	-	-	-	-	58	0	0.0%	**58**	**0**	**0.0%**
6-11	-	-	-	-	-	-	-	-	-	-	-	-	349	2	0.6%	**349**	**2**	**0.6%**
12-17	-	-	-	-	-	-	-	-	-	-	-	-	547	10	1.8%	**547**	**10**	**1.8%**
18-25	482	25	5.2%	62	0	0.0%	429	5	1.2%	8	0	0.0%	-	-	-	**981**	**30**	**3.1%**
26-35	753	94	12.5%	69	2	2.9%	719	66	9.2%	9	2	22.2%	-	-	-	**1550**	**164**	**10.6%**
36-45	700	140	20.0%	48	4	8.3%	468	60	12.8%	4	1	25.0%	-	-	-	**1220**	**205**	**16.8%**
>45	222	47	21.2%	7	2	28.6%	211	22	10.4%	2	0	0.0%	-	-	-	**442**	**71**	**16.1%**
ADULT	81	11	13.6%	19	1	5.3%	62	1	1.6%	12	0	0.0%	-	-	-	**174**	**13**	**7.5%**
SUBADULT	-	-	-	-	-	-	-	-	-	-	-	-	5	0	0.0%	**5**	**0**	**0.0%**
TOTAL	**2238**	**317**	**14.2%**	**205**	**9**	**4.4%**	**1889**	**154**	**8.2%**	**35**	**3**	**8.6%**	**1033**	**12**	**1.2%**	**5400**	**495**	**9.2%**

third of the diaphysis of the left humerus. It measures 52.3mm in length and 9.5mm in width. It is angled laterally, but is well healed.

6.4.1.1 VIOLENCE-RELATED INJURIES (VRIs)

A total of 9.2% (495/5400) of individuals presented with at least one possible violence-related injury (Table 6.18). Parry fractures were not assessed due to the fact that the position of ulna fractures could not be physically examined in order to determine if they are likely to be parry fractures or not. Similar to the pattern seen with all fractures, more males presented with VRIs than females, a difference which was statistically significant ($\chi^2 = 36.03$, df = 1, $p < 0.001$, $\Phi_c = 0.1$). There was also an increase in VRI with age. However, the increase slowed substantially by the latest age group (>45). Twelve subadults presented with at least one possible VRI, representing 1.2% (12/1033) of the total subadult population. No subadults under the age of six were affected. Overall, the individuals buried in this cemetery were quite diverse, from those of high status to those of the poorest status, as such determining specific risks that they may have been prone to is not possible besides saying that they all would have been exposed to the general risks inherent to life in medieval London that were outlined in Chapter 4.

6.4.1.1.1 Skull Trauma

Out of the 495 individuals that presented with at least one VRI, 161, or 3.8% of the total population presented with at least one skull fracture (including the cranial vault, facial bones, and dentition; Table 6.19). As with all fractures and all

Table 6.19: Crude Prevalence of Skull Trauma by Sex and Age (SRP98)

AGE	MALES			INTERMEDIATES			FEMALES			UNKNOWNS			SUBADULTS			TOTAL		
(YEARS)	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%
Perinatal	-	-	-	-	-	-	-	-	-	-	-	-	59	0	0.0%	**59**	**0**	**0.0%**
1-6m	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
7-11m	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0.0%	**2**	**0**	**0.0%**
1-5	-	-	-	-	-	-	-	-	-	-	-	-	51	0	0.0%	**51**	**0**	**0.0%**
6-11	-	-	-	-	-	-	-	-	-	-	-	-	292	1	0.3%	**292**	**1**	**0.3%**
12-17	-	-	-	-	-	-	-	-	-	-	-	-	475	6	1.3%	**475**	**6**	**1.3%**
18-25	375	15	4.0%	51	0	0.0%	356	3	0.8%	0	0	0.0%	-	-	-	**782**	**18**	**2.3%**
26-35	575	33	5.7%	46	1	2.2%	564	21	3.7%	4	0	0.0%	-	-	-	**1189**	**55**	**4.6%**
36-45	519	41	7.9%	32	0	0.0%	379	17	4.5%	1	0	0.0%	-	-	-	**931**	**58**	**6.2%**
>45	178	9	5.1%	5	0	0.0%	176	8	4.5%	0	0	0.0%	-	-	-	**359**	**17**	**4.7%**
ADULT	70	4	5.7%	14	1	7.1%	54	1	1.9%	2	0	0.0%	-	-	-	**140**	**6**	**4.3%**
SUBADULT	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0.0%	**1**	**0**	**0.0%**
TOTAL	**1717**	**102**	**5.9%**	**148**	**2**	**1.4%**	**1529**	**50**	**3.3%**	**7**	**0**	**0.0%**	**880**	**7**	**0.8%**	**4281**	**161**	**3.8%**

Table 6.20: Crude Prevalence of Cranial Vault Trauma by Sex and Age (SRP98)

AGE	MALES			INTERMEDIATES			FEMALES			UNKNOWNS			SUBADULTS			TOTAL		
(YEARS)	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%
Perinatal	-	-	-	-	-	-	-	-	-	-	-	-	59	0	0.0%	**59**	**0**	**0.0%**
1-6m	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
7-11m	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0.0%	**2**	**0**	**0.0%**
1-5	-	-	-	-	-	-	-	-	-	-	-	-	51	0	0.0%	**51**	**0**	**0.0%**
6-11	-	-	-	-	-	-	-	-	-	-	-	-	292	1	0.3%	**292**	**1**	**0.3%**
12-17	-	-	-	-	-	-	-	-	-	-	-	-	475	3	0.6%	**475**	**3**	**0.6%**
18-25	375	8	2.1%	51	0	0.0%	356	2	0.6%	0	0	0.0%	-	-	-	**782**	**10**	**1.3%**
26-35	575	19	3.3%	46	1	2.2%	564	11	2.0%	4	0	0.0%	-	-	-	**1189**	**31**	**2.6%**
36-45	519	22	4.2%	32	0	0.0%	379	3	0.8%	1	0	0.0%	-	-	-	**931**	**25**	**2.7%**
>45	178	2	1.1%	5	0	0.0%	176	4	2.3%	0	0	0.0%	-	-	-	**359**	**6**	**1.7%**
ADULT	70	3	4.3%	14	1	7.1%	54	0	0.0%	2	0	0.0%	-	-	-	**140**	**4**	**2.9%**
SUBADULT	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0.0%	**1**	**0**	**0.0%**
TOTAL	**1717**	**54**	**3.1%**	**148**	**2**	**1.4%**	**1529**	**20**	**1.3%**	**7**	**0**	**0.0%**	**880**	**4**	**0.5%**	**4281**	**80**	**1.9%**

potential VRIs, there was a statistically significant difference between the sexes ($\chi^2 = 12.33$, df = 1, $p < 0.001$, $\Phi_c = 0.1$). There was an increase in skull fracture prevalence with age, except for in the oldest age group (>45) where a decrease in prevalence was seen. However, the difference between that group and the 36-45 age group was not significant suggesting that skull fractures may have been less common amongst older individuals.

6.4.1.1.1.1 Cranial Vault Trauma

A total of 80 individuals presented with at least one injury to the cranial vault, representing 1.9% of the total assemblage (Table 6.20). Males were the most affected with 3.1% (54/1717) presenting with at least one injury. This was significantly higher than females ($\chi^2 = 11.46$, df = 1, $p < 0.001$, $\Phi_c = 0.1$). Only four subadults were affected by cranial vault fractures. Additionally, only two puncture or projectile traumas were identified, but this may be due in part to differing criteria of trauma determination between the author and the Museum of London Archaeology who collected the St Mary Spital (SRP98) data.

Blunt Force Trauma. Forty-nine individuals presented with at least one blunt force trauma to the cranial vault, representing 1.1% (49/4281) of the total population (Table 6.21). Males were the most affected with 1.9% (32/1717) affected. This was significantly greater than the number of females affected by blunt force trauma (0.8%: 12/1529). However, the relationship was weak ($\chi^2 = 6.26$, df = 1, $p = 0.01$, $\Phi_c = 0.04$). Four subadults presented with blunt force trauma, representing 0.5% (4/880) of all subadults.

Table 6.21: Crude Prevalence of Blunt Force Trauma by Sex (SRP98)

SEX	N	AFF	%
Males	1717	32	1.9%
Intermediates	148	1	0.7%
Females	1529	12	0.8%
Unknown	7	0	0.0%
Subadults	880	4	0.5%
TOTAL	**4281**	**49**	**1.1%**

Both parietals were equally affected by blunt force trauma with 0.5% of both left (17/3147) and right (16/3152) parietal bones presenting with at least one fracture (Table 5.23). The right side of the frontal bone was the next most affected with 0.4% (13/2925). A similar distribution was seen between the sexes. Although amongst males the left parietal was more affected than the right, the difference was not significant. See Table 6.23 for the full distribution.

Sharp Force Trauma. Twenty-nine individuals were affected by sharp force trauma, representing 0.7% (29/4281) of the population (Table 6.22). Males and individuals of intermediate sex were similarly affected, while females were affected to a lesser extent. The difference between males and females was statistically significant, but the relationship was weak ($\chi^2 = 4.08$, df = 1, p = 0.04, $\Phi_c = 0.04$).

Table 6.22: Crude Prevalence of Sharp Force Trauma by Sex (SRP98)

SEX	N	AFF	%
Males	1717	20	1.2%
Intermediates	148	2	1.4%
Females	1529	7	0.5%
Unknown	7	0	0.0%
Subadults	880	0	0.0%
TOTAL	**4281**	**29**	**0.7%**

The left parietal was the most affected by sharp force trauma (0.4%: 12/3147), but it did not significantly differ from any other cranial vault bone (Table 6.24). A

similar distribution was seen when looking only at males. The amount of sharp force trauma found amongst females and subadults was too small to determine a pattern. See Table 6.20 for the full distribution.

Puncture Trauma. Two individuals were identified as displaying puncture trauma. The first was a male, aged 36-45 (26580) dated to the 1250-1400 period, with a possible puncture trauma to the cranial vault. Unfortunately, the database is not more descriptive of the injury. The other individual was also a male, aged 36-45 (22087) dated to the 1400-1549 period, who presented with a fully-healed puncture trauma to the right parietal. The lesion measured approximately 15.6mm in length, 11.5mm in width, and 5.5mm in depth. The superior margin is deeper, possibly suggesting an assault from the rear.

5.4.1.1.1.2 Facial Trauma

Out of 161 individuals presenting with skull trauma, only 35 presented with at least one facial fracture, representing 0.8% of the total population (Table 6.26). As with all forms of trauma analysed, more males presented with facial fractures than females. However, while the difference was statistically significant, the strength of the relationship was weak ($\chi^2 = 5.08$, df = 1, p = 0.02, $\Phi_c = 0.04$). There was also a noticeable accumulation of fractures with age. Only one subadult, aged 12-18, was affected by facial trauma.

The nasal bones were the facial bones most affected by fracture with the left nasal bone presenting with a true prevalence of 1.1% (15/1310) and the right nasal presenting with a true prevalence of 1.3% (17/1336; Table 6.25). The

Table 6.23: True Prevalence of Blunt Force Trauma by Sex and Skull Element (SRP98)

BLUNT FORCE	MALES			INTERMEDIATES			FEMALES			UNKNOWNS			SUBADULTS			TOTAL		
TRAUMA	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%
L Frontal	1199	6	0.5%	92	0	0.0%	1077	1	0.1%	6	0	0.0%	595	0	0.0%	**2969**	**7**	**0.2%**
R Frontal	1153	10	0.9%	103	0	0.0%	1073	2	0.2%	7	0	0.0%	589	1	0.2%	**2925**	**13**	**0.4%**
L Parietal	1263	10	0.8%	113	1	0.9%	1106	4	0.4%	8	0	0.0%	657	2	0.3%	**3147**	**17**	**0.5%**
R Parietal	1272	8	0.6%	110	0	0.0%	1117	6	0.5%	9	0	0.0%	644	2	0.3%	**3152**	**16**	**0.5%**
L Temporal	1172	1	0.1%	110	0	0.0%	1026	0	0.0%	8	0	0.0%	566	0	0.0%	**2881**	**1**	**0.0%**
R Temporal	1191	1	0.1%	97	0	0.0%	1040	1	0.1%	7	0	0.0%	544	0	0.0%	**2879**	**2**	**0.1%**
Supraoccipital	1295	1	0.1%	109	0	0.0%	1122	0	0.0%	6	0	0.0%	621	0	0.0%	**3135**	**2**	**0.0%**

Table 6.24: True Prevalence of Sharp Force Trauma by Sex and Skull Element (SRP98)

SHARP FORCE	MALES			INTERMEDIATES			FEMALES			UNKNOWNS			SUBADULTS			TOTAL		
TRAUMA	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%
L Frontal	1199	4	0.3%	92	0	0.0%	1077	2	0.2%	6	0	0.0%	595	0	0.0%	**2969**	**6**	**0.2%**
R Frontal	1153	2	0.2%	103	0	0.0%	1073	1	0.1%	7	0	0.0%	589	0	0.0%	**2925**	**3**	**0.1%**
L Parietal	1263	8	0.6%	113	1	0.9%	1106	2	0.2%	8	0	0.0%	657	1	0.2%	**3147**	**12**	**0.4%**
R Parietal	1272	4	0.3%	110	0	0.0%	1117	2	0.2%	9	0	0.0%	644	0	0.0%	**3152**	**6**	**0.2%**
L Temporal	1172	0	0.0%	110	0	0.0%	1026	0	0.0%	8	0	0.0%	566	0	0.0%	**2881**	**0**	**0.0%**
R Temporal	1191	0	0.0%	97	0	0.0%	1040	0	0.0%	7	0	0.0%	544	0	0.0%	**2879**	**0**	**0.0%**
Supraoccipital	1295	0	0.0%	109	0	0.0%	1122	0	0.0%	6	0	0.0%	621	0	0.0%	**3135**	**0**	**0.0%**

Table 6.25: True Prevalence of Facial Trauma by Sex and Skull Element (SRP98)

FACIAL	MALES			INTERMEDIATES			FEMALES			UNKNOWNS			SUBADULTS			TOTAL		
TRAUMA	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%
L Mandible	1260	3	0.2%	107	0	0.0%	1098	1	0.1%	8	0	0.0%	652	0	0.0%	**3115**	**4**	**0.1%**
R Mandible	1210	2	0.2%	114	0	0.0%	1088	1	0.1%	9	0	0.0%	636	0	0.0%	**3057**	**3**	**0.1%**
L Maxilla	1095	2	0.2%	93	0	0.0%	956	0	0.0%	7	0	0.0%	555	0	0.0%	**2706**	**2**	**0.1%**
R Maxilla	1079	2	0.2%	80	0	0.0%	985	0	0.0%	5	0	0.0%	554	0	0.0%	**2703**	**2**	**0.1%**
L Nasal	606	10	1.7%	37	0	0.0%	507	4	0.8%	1	0	0.0%	159	1	0.6%	**1310**	**15**	**1.1%**
R Nasal	615	12	2.0%	40	0	0.0%	513	4	0.8%	1	0	0.0%	167	1	0.6%	**1336**	**17**	**1.3%**
L Zygomatic	987	2	0.2%	79	0	0.0%	852	0	0.0%	6	0	0.0%	459	0	0.0%	**2383**	**2**	**0.1%**
R Zygomatic	1048	0	0.0%	88	0	0.0%	885	0	0.0%	5	0	0.0%	478	0	0.0%	**2504**	**0**	**0.0%**

Table 6.26: Crude Prevalence of Facial Trauma by Sex and Age (SRP98)

AGE	MALES			INTERMEDIATES			FEMALES			UNKNOWNS			SUBADULTS			TOTAL		
(YEARS)	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%
Perinatal	-	-	-	-	-	-	-	-	-	-	-	-	38	0	0.0%	**38**	**0**	**0.0%**
1-6m	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
7-11m	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0.0%	**1**	**0**	**0.0%**
1-5	-	-	-	-	-	-	-	-	-	-	-	-	45	0	0.0%	**45**	**0**	**0.0%**
6-11	-	-	-	-	-	-	-	-	-	-	-	-	283	0	0.0%	**283**	**0**	**0.0%**
12-17	-	-	-	-	-	-	-	-	-	-	-	-	473	1	0.2%	**473**	**1**	**0.2%**
18-25	374	3	0.8%	52	0	0.0%	357	0	0.0%	1	0	0.0%	-	-	-	**784**	**3**	**0.4%**
26-35	571	8	1.4%	47	0	0.0%	561	4	0.7%	2	0	0.0%	-	-	-	**1181**	**12**	**1.0%**
36-45	516	9	1.7%	33	0	0.0%	377	4	1.1%	0	0	0.0%	-	-	-	**926**	**13**	**1.4%**
>45	174	5	2.9%	2	0	0.0%	174	1	0.6%	0	0	0.0%	-	-	-	**350**	**6**	**1.7%**
ADULT	72	0	0.0%	6	0	0.0%	53	0	0.0%	3	0	0.0%	-	-	-	**134**	**0**	**0.0%**
SUBADULT	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0.0%	**1**	**0**	**0.0%**
TOTAL	**1707**	**25**	**1.5%**	**140**	**0**	**0.0%**	**1522**	**9**	**0.6%**	**6**	**0**	**0.0%**	**841**	**1**	**0.1%**	**4216**	**35**	**0.8%**

Table 6.27: Crude Prevalence of Dental Trauma by Sex and Age (SRP98)

AGE	MALES			INTERMEDIATES			FEMALES			UNKNOWNS			SUBADULTS			TOTAL		
(YEARS)	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%
Perinatal	-	-	-	-	-	-	-	-	-	-	-	-	8	0	0.0%	**8**	**0**	**0.0%**
1-6m	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0.0%	**1**	**0**	**0.0%**
7-11m	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0.0%	**2**	**0**	**0.0%**
1-5	-	-	-	-	-	-	-	-	-	-	-	-	47	0	0.0%	**47**	**0**	**0.0%**
6-11	-	-	-	-	-	-	-	-	-	-	-	-	289	0	0.0%	**289**	**0**	**0.0%**
12-17	-	-	-	-	-	-	-	-	-	-	-	-	485	2	0.4%	**485**	**2**	**0.4%**
18-25	379	4	1.1%	56	0	0.0%	361	1	0.3%	2	0	0.0%	-	-	-	**798**	**5**	**0.6%**
26-35	581	6	1.0%	44	0	0.0%	573	6	1.0%	5	0	0.0%	-	-	-	**1203**	**12**	**1.0%**
36-45	518	10	1.9%	33	0	0.0%	379	10	2.6%	0	0	0.0%	-	-	-	**930**	**20**	**2.2%**
>45	177	2	1.1%	5	0	0.0%	177	3	1.7%	1	0	0.0%	-	-	-	**360**	**5**	**1.4%**
ADULT	70	1	1.4%	12	0	0.0%	53	1	1.9%	3	0	0.0%	-	-	-	**138**	**2**	**1.4%**
SUBADULT	-	-	-	-	-	-	-	-	-	-	-	-	3	0	0.0%	**3**	**0**	**0.0%**
TOTAL	**1725**	**23**	**1.3%**	**150**	**0**	**0.0%**	**1543**	**21**	**1.4%**	**11**	**0**	**0.0%**	**835**	**2**	**0.2%**	**4264**	**46**	**1.1%**

nasal bones were significantly more affected than any other facial bone (Fisher's Exact Test: $p < 0.001$, $\Phi_c = 0.1$). The mandible and maxilla were similarly affected, while the zygomatic bones were the least affected.

6.4.1.1.1.3 Dental Trauma

A total of 1.1% (46/4264) of the total population presented with at least one tooth fracture (Table 6.27). Unlike other types of trauma, males and females were similarly affected with no statistically significant difference between them. This possibly suggests that the dental fractures were caused by an activity that was similarly done by both sexes. There was also an accumulation of fractures with age, except for in the oldest age group (>45), which had a smaller prevalence than the next oldest age group (36-45). However, the difference was not statistically significant. Only two subadults, both aged 12-17, presented with a dental fracture, representing 0.2% (2/835) of all subadults.

6.4.1.1.2 Rib Fractures

A total of 6.5% (257/3962) of the total population presented with at least one rib fracture (Table 6.28). Males presented with more rib fractures than females, however, the difference was not statistically significant. Rib fractures did appear to increase with age, with a particularly sizeable increase in prevalence between the youngest adult age group (18-25) and the next oldest age group (26-35), a difference which was statistically significant ($\chi^2 = 10.08$, df = 1, $p = 0.002$, $\Phi_c = 0.1$). Five subadults presented with at least one rib fracture, representing 0.7% (5/717) of the subadult population: four were aged 12-17 and one was aged 6-11).

Table 6.28: Crude Prevalence of Rib Fractures by Sex and Age (SRP98)

AGE	MALES			INTERMEDIATES			FEMALES			UNKNOWNS			SUBADULTS			TOTAL		
(YEARS)	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%
Perinatal	-	-	-	-	-	-	-	-	-	-	-	-	26	0	0.0%	**26**	**0**	**0.0%**
1-6m	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
7-11m	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
1-5	-	-	-	-	-	-	-	-	-	-	-	-	37	0	0.0%	**37**	**0**	**0.0%**
6-11	-	-	-	-	-	-	-	-	-	-	-	-	236	1	0.4%	**236**	**1**	**0.4%**
12-17	-	-	-	-	-	-	-	-	-	-	-	-	415	4	1.0%	**415**	**4**	**1.0%**
18-25	386	6	1.6%	46	0	0.0%	337	2	0.6%	5	0	0.0%	-	-	-	**774**	**8**	**1.0%**
26-35	536	38	7.1%	53	1	1.9%	550	35	6.4%	6	1	16.7%	-	-	-	**1145**	**75**	**6.6%**
36-45	544	83	15.3%	31	4	12.9%	345	34	9.9%	1	1	100.0%	-	-	-	**921**	**122**	**13.2%**
>45	168	30	17.9%	4	2	50.0%	159	9	5.7%	0	0	0.0%	-	-	-	**331**	**41**	**12.4%**
ADULT	36	6	16.7%	4	0	0.0%	31	0	0.0%	3	0	0.0%	-	-	-	**74**	**6**	**8.1%**
SUBADULT	-	-	-	-	-	-	-	-	-	-	-	-	3	0	0.0%	**3**	**0**	**0.0%**
TOTAL	**1670**	**163**	**9.8%**	**138**	**7**	**5.1%**	**1422**	**80**	**5.6%**	**15**	**2**	**13.3%**	**717**	**5**	**0.7%**	**3962**	**257**	**6.5%**

Table 6.29: Crude Prevalence of Metacarpal Fractures by Sex and Age (SRP98)

AGE	MALES			INTERMEDIATES			FEMALES			UNKNOWNS			SUBADULTS			TOTAL		
(YEARS)	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%
Perinatal	-	-	-	-	-	-	-	-	-	-	-	-	33	0	0.0%	**33**	**0**	**0.0%**
1-6m	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
7-11m	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
1-5	-	-	-	-	-	-	-	-	-	-	-	-	25	0	0.0%	**25**	**0**	**0.0%**
6-11	-	-	-	-	-	-	-	-	-	-	-	-	204	0	0.0%	**204**	**0**	**0.0%**
12-17	-	-	-	-	-	-	-	-	-	-	-	-	358	0	0.0%	**358**	**0**	**0.0%**
18-25	302	4	1.3%	41	0	0.0%	277	0	0.0%	5	0	0.0%	-	-	-	**625**	**4**	**0.6%**
26-35	533	23	4.3%	51	0	0.0%	506	10	2.0%	5	1	20.0%	-	-	-	**1095**	**34**	**3.1%**
36-45	503	16	3.2%	37	0	0.0%	325	9	2.8%	3	0	0.0%	-	-	-	**868**	**25**	**2.9%**
>45	157	8	5.1%	5	0	0.0%	146	5	3.4%	0	0	0.0%	-	-	-	**308**	**13**	**4.2%**
ADULT	41	1	2.4%	6	0	0.0%	28	0	0.0%	5	0	0.0%	-	-	-	**80**	**1**	**1.3%**
SUBADULT	-	-	-	-	-	-	-	-	-	-	-	-	3	0	0.0%	**3**	**0**	**0.0%**
TOTAL	**1536**	**52**	**3.4%**	**140**	**0**	**0.0%**	**1282**	**24**	**1.9%**	**18**	**1**	**5.6%**	**623**	**0**	**0.0%**	**3599**	**77**	**2.1%**

6.4.1.1.1.3 Metacarpal Fractures

Seventy-seven individuals presented with at least one metacarpal fracture, representing 2.1% (77/3599) of the total population (Table 6.29). More males were affected by metacarpal fractures than females. While the difference was statistically significant, the relationship was weak ($\chi^2 = 5.54$, df = 1, p = 0.02, $\Phi_c = 0.04$). While there was a general pattern of accumulation of fractures with age, the largest difference was seen between the youngest adult group (18-25) and the next oldest age group (26-35). There was little difference seen between the older adult age groups. No subadults presented with metacarpal fractures.

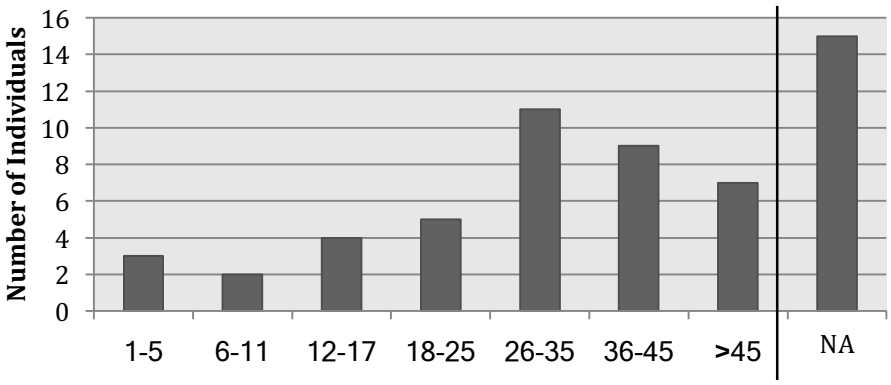
6.5 BLACKFRIARS (PIC87)

A total of 56 individuals were analysed from the London Blackfriars site and all were roughly dated to between 1200 and 1538. The sex ratio was 1.3:1, with slightly more males present than females. This is a very even sex ratio for a monastic site, possibly indicating that the vast majority of those excavated were from the lay population (Table 6.30; see Chapter 4 for more information). The number of individuals increased with age, until it peaked at the 26-35 age group (Figure 6.20). The older age groups see a decline in the number of individuals present. A difference was seen between the number of males and females represented in each age group. For males, age-at-death peaked at 26-35 with six individuals (Table 6.31). For females, age-at-death did not peak until the 36-45 age group.

Table 6.30: Number of Individuals by Sex (PIC87)

SEX	N	% OF TOTAL
Males	16	28.6%
Intermediates	5	8.9%
Females	12	21.4%
NA	14	25.0%
Subadults	9	16.1%
TOTAL	**56**	**100.0%**

Figure 6.20: Number of Individuals by Age Category (PIC87)



NA is the classification for adults whose age could not be determined

Table 6.31: Number of Adults by Sex and Age (PIC87)

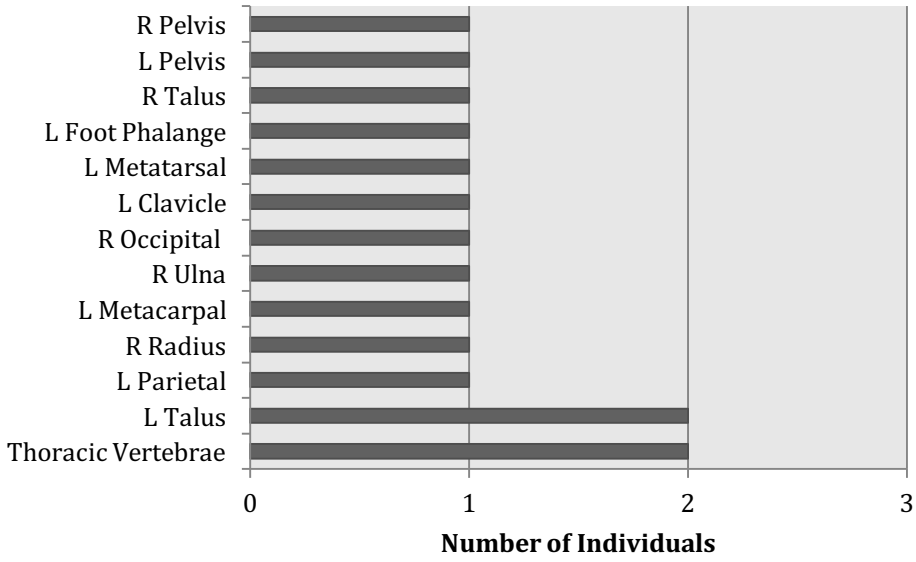
AGE	TOTAL	MALES		INTERMEDIATES		FEMALES		UNKNOWN	
	N	N	%	N	%	N	%	N	%
18-25	5	3	60.0%	1	20.0%	1	20.0%	0	0.0%
26-35	11	6	54.5%	2	18.2%	3	27.3%	0	0.0%
36-45	9	3	33.3%	1	11.1%	4	44.4%	1	11.1%
>45	7	3	42.9%	1	14.3%	3	42.9%	0	0.0%
NA	15	1	6.7%	0	0.0%	1	6.7%	13	86.7%
TOTAL	**47**	**16**	**34.0%**	**5**	**10.6%**	**12**	**25.5%**	**14**	**29.8%**

6.5.1 TRAUMA

In the Blackfriars (PIC87) collection there were nine individuals presenting with at least one fracture, representing 16.1% (9/56) of the total population. Between those nine individuals there were a total of 17 fractures. Three individuals presented with two fractures each and one presented with six. All the other individuals presented with one fracture each. The individual with six fractures was a male, aged 26-35 (450), with fractures to the posterior calcaneal articular

surface of both tali, the superior margins of both acetabula, the base of the 1st proximal foot phalanx and the T3 centrum. The fractures are consistent with landing on one's feet after a jump or fall from a great height. In terms of location, the thoracic vertebrae and left talus each presented with two fractures. Every other fracture was found on a separate bone. The full distribution of fractures by location is shown in Figure 6.21.

Figure 6.21: Number of Individuals with Fractures by Location (PIC87)



Males presented with the highest crude prevalence of fractures: 31.6% (5/16) were affected. Females followed with 25.0% (3/12) affected and then adults of undetermined sex with 7.1% (1/14). No intermediate adults or subadults presented with fractures. There was no statistically significant difference between the sexes or between adults and subadults in terms of the crude prevalence of fractures. Table 6.32 shows the full distribution of fractures by sex.

Adults aged 18-25 presented with the highest proportion of fractures with 40.0% (2/5) affected. Adults aged 36-45 followed with 22.2% (2/9), then adults aged 26-35 with 18.2% (2/11) presenting with fractures. Adults aged >45 and

Table 6.32: Crude Prevalence of All Fractures by Sex and Age (PIC87)

AGE	MALES			INTERMEDIATES			FEMALES			UNKNOWNS			SUBADULTS			TOTAL		
	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%
Perinatal	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
1-6m	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
7-11m	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
1-5	-	-	-	-	-	-	-	-	-	-	-	-	3	0	0.0%	**3**	**0**	**0.0%**
6-11	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0.0%	**2**	**0**	**0.0%**
12-17	-	-	-	-	-	-	-	-	-	-	-	-	4	0	0.0%	**4**	**0**	**0.0%**
18-25	3	2	66.7%	1	0	0.0%	1	0	0.0%	0	0	0.0%	-	-	-	**5**	**2**	**40.0%**
26-35	6	1	16.7%	2	0	0.0%	3	1	33.3%	0	0	0.0%	-	-	-	**11**	**2**	**18.2%**
36-45	3	2	66.7%	1	0	0.0%	4	0	0.0%	1	0	0.0%	-	-	-	**9**	**2**	**22.2%**
>45	3	0	0.0%	1	0	0.0%	3	1	33.3%	0	0	0.0%	-	-	-	**7**	**1**	**14.3%**
NA	1	0	0.0%	0	0	0.0%	1	1	100.0%	13	1	7.7%	-	-	-	**15**	**2**	**13.3%**
SA NA	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
TOTAL	**16**	**5**	**31.6%**	**5**	**0**	**0.0%**	**12**	**3**	**25.0%**	**14**	**1**	**7.1%**	**9**	**0**	**0.0%**	**56**	**9**	**16.1%**

Table 6.33: Crude Prevalence of VRI by Sex and Age (PIC87)

AGE	MALES			INTERMEDIATES			FEMALES			UNKNOWNS			SUBADULTS			TOTAL		
	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%
Perinatal	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
1-6m	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
7-11m	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
1-5	-	-	-	-	-	-	-	-	-	-	-	-	3	0	0.0%	**3**	**0**	**0.0%**
6-11	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0.0%	**2**	**0**	**0.0%**
12-17	-	-	-	-	-	-	-	-	-	-	-	-	4	0	0.0%	**4**	**0**	**0.0%**
18-25	3	1	33.3%	1	0	0.0%	1	0	0.0%	0	0	0.0%	-	-	-	**5**	**1**	**20.0%**
26-35	6	0	0.0%	2	0	0.0%	3	0	0.0%	0	0	0.0%	-	-	-	**11**	**0**	**0.0%**
36-45	3	1	33.3%	1	0	0.0%	4	0	0.0%	1	0	0.0%	-	-	-	**9**	**1**	**11.1%**
>45	3	0	0.0%	1	0	0.0%	3	0	0.0%	0	0	0.0%	-	-	-	**7**	**0**	**0.0%**
NA	1	0	0.0%	0	0	0.0%	1	1	100.0%	13	0	0.0%	-	-	-	**15**	**1**	**6.7%**
SA NA	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
TOTAL	**16**	**2**	**12.5%**	**5**	**0**	**0.0%**	**12**	**1**	**8.3%**	**14**	**0**	**0.0%**	**9**	**0**	**0.0%**	**56**	**3**	**5.4%**

adults of undetermined age were the least affected with 14.3% (1/7) and 13.3% (2/15) presenting with fractures respectively. These results are interesting as they do not follow the expected accumulation of fractures with age, although this may be due in part to the overall small sample size. No subadults in any age category were affected by fractures. There were no statistically significant differences between the various age groups. A full distribution of fractures by age category is shown in Table 6.32.

No individuals presented with any dislocations or subluxations. One individual, a person of intermediate sex, aged older than 45 (159), presented with a possible case of *myositis ossificans traumatica* on the middle of the diaphysis of the right humerus.

6.5.1.1 VIOLENCE-RELATED INJURIES

Three individuals from the Blackfriars (PIC87) collection presented with trauma in a location that was possibly indicative of violence. They represent 5.4% (3/56) of the total population (Table 6.33). There was a total of four fractures amongst these three individuals. One individual had two fractures, while the others each had one. The individual with two fractures was a probable female of undetermined age with a fracture to the left clavicle and a depression fracture to the left parietal. The full list of individuals affected by VRI is shown in Table 6.34.

Table 6.34: Individuals with Possible VRI

Context #	Sex	Age	# of Fractures	Location	Notes
227	F?	NA	2	Left clavicle; left parietal	Parietal - BFT
379	M	18-25	1	Right occipital	BFT
504	M	36-45	1	Left 5th metacarpal	Impacted

In terms of location, two individuals presented with fractures to the cranial vault. The other individual with VRI had a fracture to the distal end of the 5th metacarpal body. Regarding true prevalence of VRI, the occipital was the most affected bone with 3.3% (1/30) affected. The left parietal had a true prevalence of 2.9% (1/35) and the left metacarpals, 0.6% (1/157).

Males presented with the highest proportion of possible VRI with 12.5% (2/16) affected. Females followed with 8.3% (1/12). No intermediates, adults whose age could not be determined, or subadults presented with possible VRI. There were no statistically significant differences between the sexes or between adults and subadults. The full distribution of VRI by sex is shown in Table 6.33.

Adults aged 18-25 presented with the largest proportion of possible VRI with 20.0% (1/5) affected. They were followed by adults aged 36-45 with 11.1% (1/9) affected and adults of undetermined age with 6.7% (1/15). No adults aged >45 or subadults of any age category presented with fractures. There were no statistically significant differences between the various age groups. The full distribution of VRI by age is shown in Table 6.33.

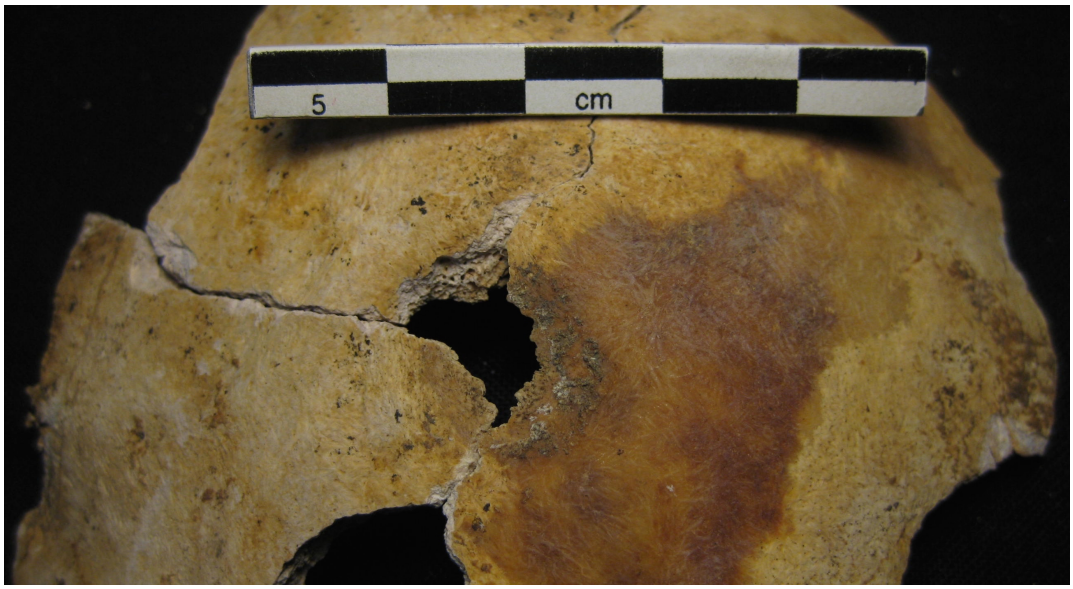
6.5.1.1.1 Skull Trauma

Two of the individuals presented with fractures to the skull: one male (379) and one female (227). Both presented with well-healed depression fractures to the cranial vault. No individuals presented with facial or dental trauma.

6.5.1.1.1.1 Cranial Vault

One individual, a probable female of undetermined age (227), presented with a well-healed blunt force trauma to the left parietal as well as an oblique fracture to the left clavicle. The cranial lesion was approximately 15mm in length and 13mm in width. It was located approximately 30mm from the lambdoidal suture and 30mm from the squamosal suture, above the hat-brim line (Figure 6.22). The lesion was fully healed but a hole, penetrating the width of the endocranium, remains. The lesion is highly consistent with violence, but the fractured clavicle indicates that a fall or other accident could also be to blame. As she may have been of upper to upper-middling status, she may have frequently ridden a horse or carriage and falling from either could certainly have caused such a pattern of injuries.

Figure 6.22: Individual 227, a female on unknown age, presenting with a healed blunt force trauma to the left parietal which penetrated the endocranium (there is minor postmortem damage around the margins of the lesion).



The other individual with a cranial fracture was a male aged 18-25 (379) who presented with a healed blunt force trauma to the right occipital at the lambdoidal suture. The lesion measured approximately 11mm in length and

7mm in width and is located above the hat-brim line. It was, however, quite close to the suture, which showed signs of uneven fusion. This suggests that while the lesion may be consistent with violence there may be other causes such as falling on to a blunt object or a differential diagnosis of uneven suture fusion.

6.5.1.1.2 Metacarpal Fractures

One individual, a male aged 36-45 (504), presented with a fracture to the distal epiphysis of the right fifth metacarpal. There was slight damage to the joints, including pitting and bone growth, around the fractured epiphysis as well as the proximal epiphysis of the right 5th proximal hand phalanx. The location of the injury and type of fracture are consistent with violence.

6.6 ST MARY GRACES (MIN86)

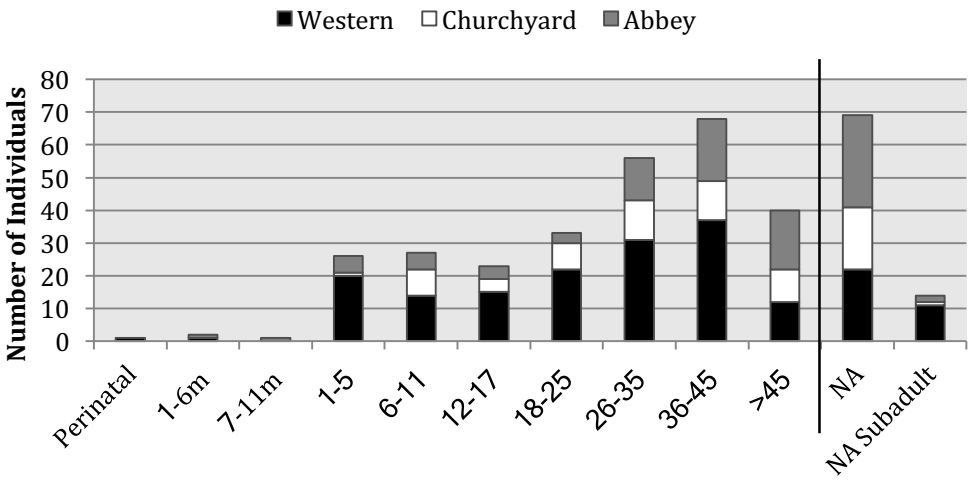
Including all burial sites, 443 graves were excavated from the St Mary Graces (MIN86) site for a total of 424 skeletons that were curated for study: 221 skeletons from the western cemetery (roughly dated to 1350-1400), 91 from the abbey churchyard (roughly dated to 1400-1539), and 112 from the abbey church and cloister (roughly dated to 1361-1539; Grainger and Phillpotts, 2011). Excluding those with extremely poor preservation, very low bone count or ones that could not be found, a total of 361 skeletons was analysed for this study: 187 skeletons from the western cemetery and 174 from the St Mary Graces precinct, the latter comprising 75 from the abbey churchyard and 99 from the abbey church and cloister.

The sex ratio of those buried in the abbey buildings and cloisters was 2.8:1, and for those buried in the abbey churchyard, 2.7:1. This indicates a mixture of both a lay and religious population. There was no distinction in burial location between lay and religious burials so the two were unable to be separated for analysis. All females and subadults in the abbey church and cloister are likely to have been part of the lay population as the ecclesiastic burials only included abbey leaders. Additionally, there were no female servants listed in the staff or servant rosters, possibly indicating that all females buried in the abbey churchyard were from the lay population as well (Granger and Phillpotts, 2011). The sex ratio for the western cemetery was 1.5:1, indicating that it most likely interred a completely lay population. Table 6.35 shows the full distribution of sex by burial location. The age distribution shows that, for all burial locations, the number of individuals increased with age, peaking at the 36-45 age group (Figure 6.23). Subadult numbers were evenly distributed between the three oldest subadult age groups.

Table 6.35: Number of Individuals by Sex and Burial Location (MIN86)

SEX	WESTERN CEMETERY		ABBEY CHURCHYARD		ABBEY BUILDINGS		TOTAL	
	N	%	N	%	N	%	N	%
Males	61	33.1%	35	46.7%	39	39.4%	135	37.4%
Intermediates	5	2.7%	1	1.3%	3	3.0%	9	2.5%
Females	40	21.6%	13	17.3%	14	14.1%	67	18.6%
NA	18	9.7%	12	16.0%	25	25.3%	55	15.2%
Subadults	63	33.5%	14	18.7%	18	18.2%	95	26.3%
TOTAL	**187**	**100.0%**	**75**	**100.0%**	**99**	**100.0%**	**361**	**100.0%**

Figure 6.23: Number of Individuals by Age Category and Burial Location (MIN86)



NA and NA Subadult are the classifications for adults and subadults whose age could not be determined

6.6.1 TRAUMA

In the St Mary Graces (MIN86) collection there were a total of 85 individuals that presented with at least one fracture, representing 23.5%% (85/361) of the total assemblage (Table 6.32). Between those 85 individuals there were a total of 153 fractures. Thirty-two individuals had two or more fractures and the remaining 53 each had one fracture.

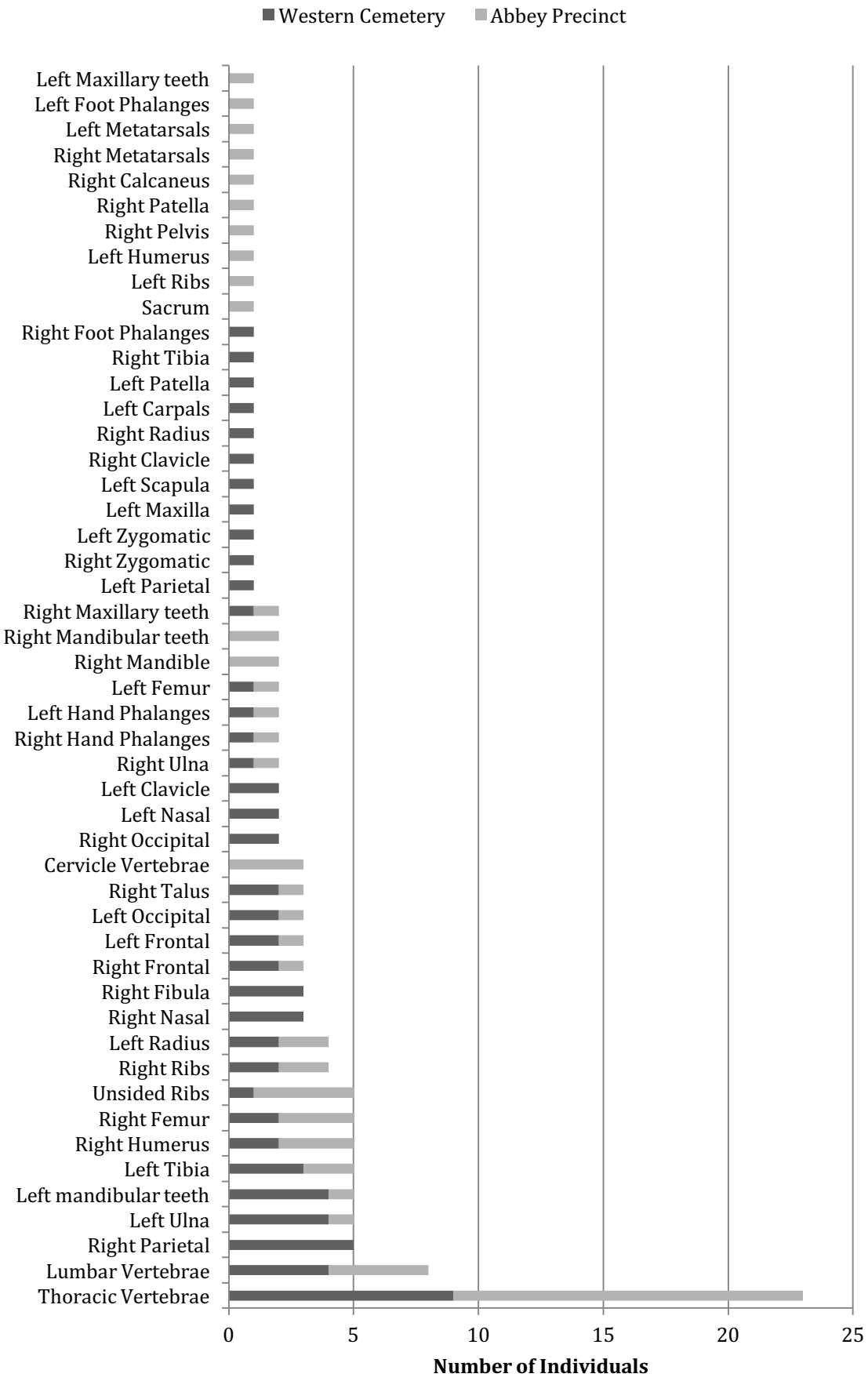
No dislocations were identified, but four possible soft tissue traumas were. Two of the affected were male: one presented with a healed bony protrusion on the left posterior C5 facet (16052; this was the same vertebra that exhibited sharp force trauma indicative of a decapitation – that injury is discussed in more detail below), and the other, aged 18-15 (10058), presented with a bony protrusion in conjunction with a possible spiral fracture to the distal end of right humeral diaphysis. Of the other two individuals affected, one was a female, aged 26-35

(12747) with a bony protrustion on the distal end of the left fibula, and the other was a subadult, aged 12-17 (9665) with a possible *myositis ossificans traumatica* on the proximal end of the right femur, near the femoral neck.

In terms of location, the thoracic vertebrae had the highest prevalence with 23 individuals presenting with a fracture in this location. The next most prevalent locations were the ribs with ten individuals and the the lumbar vertebrae with eight. The right parietal, right humerus, left ulna, right femur, left tibia, and the left mandibular teeth all had five individuals each presenting with a fracture. The full distribution of fractures by location is shown in Figure 6.24.

Males had the highest proportion of fractures with 43.0% (58/135) presenting with at least one fracture. Females had the next higest proportion with 23.9% (16/67) affected, followed by intermediate adults with 11.1% (1/9) and adults of undetermined sex with 12.7% (7/55) affected. Three subadults presented with fractures, representing 3.2% (3/95) of their total. The difference between males and females was statistically significant ($\chi^2 = 6.226$, df =1, $p = 0.013$, $\Phi_c = 0.18$). The difference between adults and subadults presenting with fractures was also statistically significant ($\chi^2 = 28.253$, df = 1, $p < 0.001$, $\Phi_c = 0.28$). The full distribution of fractured individuals by sex is shown in Table 6.38.

Figure 6.24: Number of Individuals with Fracture by Location (MIN86)



Adults aged 36-45 presented with the largest crude prevalence of fractures: 45.6% (31/68) were affected. Subadults were the least affected, with 8.7% (2/23) of subadults aged 12-17 and 3.6% (1/28) of subadults aged 6-11 presenting with fractures. No subadults under the age of six presented with fractures. It is worth noting that these results follow the predicted accumulation of fractures with age, excepting in the adults over 45 category, although the difference was not significant. There was also a stastically significant difference between the age groups presenting with bone fractures ($\chi^2 = 22.6$, df – 5, $p < 0.001$, $\Phi_c = 0.30$). Both subadult categories presented with a lower crude prevalence of bone fracture than would be expected by chance, while adults aged 36-45 presented with a greater crude prevalence than expected. The full distribution of fractured individiuals by age category is shown in Table 6.38.

The St Mary Graces (MIN86) collection had two distinct burial locations: the western cemetery and the abbey precinct. Within the abbey precinct there were both intramural burials in the abbey church and cloisters and extramural burials in the abbey churchyard. There was no discernible difference in crude prevalence between the western cemetery burials and the abbey precinct burials (Tables 6.36 and 6.37). There was also no significant difference in overall fracture prevalence between the burials in the abbey churchyard and the burials within the abbey itself.

Table 6.36: Crude Prevalence of Fracture by Burial Location (MIN86)

BURIAL LOCATION	N	AFF	%
Western Cemetery	187	44	23.5%
Abbey Precinct	174	41	23.6%
Churchyard	*75*	*21*	*28.0%*
Abbey	*99*	*20*	*20.2%*
TOTAL	**361**	**85**	**23.5%**

Table 6.37: Crude Prevalence of Fracture by Sex and Burial Location (MIN86)

BURIAL LOCATION	MALES			FEMALES			SUBADULTS		
	N	AFF	%	N	AFF	%	N	AFF	%
Western Cemetery	61	29	47.5%	40	11	27.5%	63	2	3.2%
Abbey Precinct	74	29	39.2%	27	5	18.5%	32	1	3.1%
Churchyard	*35*	*15*	*42.9%*	*13*	*2*	*15.4%*	*14*	*0*	*0.0%*
Abbey	*39*	*14*	*35.9%*	*14*	*3*	*21.4%*	*18*	*1*	*5.6%*
TOTAL	**135**	**58**	**43.0%**	**67**	**16**	**23.9%**	**95**	**3**	**3.2%**

6.6.1.1 VIOLENCE-RELATED INJURIES

In the St Mary Graces (MIN86) collection there were a total of 39 individuals that presented with fractures to locations that indicates they were possibly caused by a violent event. They represented 10.8% (39/361) of the overall assemblage (Table 6.39). Between those 39 individuals there were a total of 86 fractures, although not all are necessarily violence-related. Twenty-three individuals had two or more fractures and the remaining 16 all had one fracture each. The majority of the violence-related trauma was concentrated around the skull with 26 individuals presenting with at least one fracture to this location. Ribs were the next most prevalent location with ten individuals.

The vast majority of individuals presenting with possible VRI were male with 20.0% (27/135) affected. Females had the next largest percentage of possible VRI with 10.4% (7/67) affected. Adults of undetermined sex and subadults followed with 5.5% (3/55) and 2.1% (2/95) affected by VRI respectively. The difference between males and females presenting with possible VRI is not statistically significant. The difference between adults and subadults, however, is ($\chi^2 = 8.9346$, df = 1, p = 0.003, $\Phi_c = 0.16$). The full distribution of possible VRI by sex is shown in Table 6.39.

Table 6.38: Crude Prevalence of All Fractures by Sex and Age (MIN86)

	MALES			INTERMEDIATES			FEMALES			UNKNOWNS			SUBADULTS			TOTAL		
AGE	**N**	**AFF**	**%**	**N**	**AFF**	**%**	**N**	**AFF**	**%**	**N**	**AFF**	**%**	**N**	**AFF**	**%**	**N**	**AFF**	**%**
Perinatal	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0.0%	**1**	**0**	**0.0%**
1-6m	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0.0%	**2**	**0**	**0.0%**
7-11m	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0.0%	**1**	**0**	**0.0%**
1-5	-	-	-	-	-	-	-	-	-	-	-	-	26	0	0.0%	**26**	**0**	**0.0%**
6-11	-	-	-	-	-	-	-	-	-	-	-	-	28	1	3.6%	**28**	**1**	**3.6%**
12-17	-	-	-	-	-	-	-	-	-	-	-	-	23	2	8.7%	**23**	**2**	**8.7%**
18-25	17	6	35.3%	1	0	0.0%	13	3	23.1%	2	0	0.0%	-	-	-	**33**	**9**	**27.3%**
26-35	30	12	40.0%	1	0	0.0%	22	3	13.6%	3	2	66.7%	-	-	-	**56**	**17**	**30.4%**
36-45	46	25	54.3%	3	1	33.3%	18	5	27.8%	1	0	0.0%	-	-	-	**68**	**31**	**45.6%**
>45	28	10	35.7%	2	0	0.0%	10	3	30.0%	0	0	0.0%	-	-	-	**40**	**13**	**32.5%**
NA	14	5	35.7%	2	0	0.0%	4	2	50.0%	49	5	10.2%	-	-	-	**69**	**12**	**17.4%**
SA NA	-	-	-	-	-	-	-	-	-	-	-	-	14	0	0.0%	**14**	**0**	**0.0%**
TOTAL	**135**	**58**	**43.0%**	**9**	**1**	**11.1%**	**67**	**16**	**23.9%**	**55**	**7**	**12.7%**	**95**	**3**	**3.2%**	**361**	**85**	**23.5%**

Table 6.39: Crude Prevalence of VRI by Sex and Age (MIN86)

AGE	MALES			INTERMEDIATES			FEMALES			UNKNOWNS			SUBADULTS			TOTAL		
	N	**AFF**	**%**	**N**	**AFF**	**%**	**N**	**AFF**	**%**	**N**	**AFF**	**%**	**N**	**AFF**	**%**	**N**	**AFF**	**%**
Perinatal	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0.0%	**1**	**0**	**0.0%**
1-6m	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0.0%	**2**	**0**	**0.0%**
7-11m	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0.0%	**1**	**0**	**0.0%**
1-5	-	-	-	-	-	-	-	-	-	-	-	-	26	0	0.0%	**26**	**0**	**0.0%**
6-11	-	-	-	-	-	-	-	-	-	-	-	-	28	1	3.6%	**28**	**1**	**3.6%**
12-17	-	-	-	-	-	-	-	-	-	-	-	-	23	1	4.3%	**23**	**1**	**4.3%**
18-25	17	2	11.8%	1	0	0.0%	13	1	7.7%	2	0	0.0%	-	-	-	**33**	**3**	**9.1%**
26-35	30	5	16.7%	1	0	0.0%	22	0	0.0%	3	2	66.7%	-	-	-	**56**	**7**	**12.5%**
36-45	46	11	23.9%	3	0	0.0%	18	3	16.7%	1	0	0.0%	-	-	-	**68**	**14**	**20.6%**
>45	28	6	21.4%	2	0	0.0%	10	1	10.0%	0	0	0.0%	-	-	-	**40**	**7**	**17.5%**
NA	14	3	21.4%	2	0	0.0%	4	2	50.0%	49	1	2.0%	-	-	-	**69**	**6**	**8.7%**
SA NA	-	-	-	-	-	-	-	-	-	-	-	-	14	0	0.0%	**14**	**0**	**0.0%**
TOTAL	**135**	**27**	**20.0%**	**9**	**0**	**0.0%**	**67**	**7**	**10.4%**	**55**	**3**	**5.5%**	**95**	**2**	**2.1%**	**361**	**39**	**10.8%**

A pattern of accumulation of VRI with age is present. Adults aged 36-45 were the most affected with 20.6% (14/68), and adults aged >45 followed with 17.5% (7/40) presenting with possible VRI. Adults aged 26-35 were the next most affected age group with 12.5% (7/56) affected. Adults aged 18-25 and adults of undetermined age had the least amount of VRI, presenting with 9.1% (3/33) and 8.7% (6/69) respectively. Approximately four per cent (1/23) of subadults aged 12-17 and 3.6% (1/28) of subadults aged 6-11 were affected by possible VRI. While the varying crude prevalence between the age groups suggests an accumulation of VRI with age, there were no statistically significant differences between them. Table 6.39 shows the full distribution of VRI by age category.

6.6.1.1.1 Perimortem Trauma

Four of the 39 individuals with possible VRI presented with perimortem trauma. Three of the individuals were male (two from the western cemetery and one from the abbey precinct) and one female (from the western cemetery). Two of the injuries were to the skull and the other two affected the post-cranial skeleton (a C5 vertebra and fibula). All four cases are discussed further below.

6.6.1.1.2 Skull Trauma

A total of 12.5% (26/208) of individuals in the sample were affected by skull fractures, including facial and dental fractures. Individuals from the western cemetery presented with the highest prevalence of skull fracture (15.1%: 18/119), but it was not significantly higher than any of the other burial locations (Table 6.40). Although more males presented with skull fractures (18.6%: 18.97) than females (11.9%: 5/42), the difference was not statistically significant (Table

6.41). However, significantly more males buried in the western cemetery (28.3%: 13/46) presented with skull fractures than males buried in the abbey precinct (9.8%: 95/51; $\chi^2 = 4.2987$, df = 1, p = 0.038, $\Phi_c = 0.21$). There was no significant difference between the females or subadults from each burial location.

Table 6.40: Crude Prevalence of Skull Fracture by Burial Location (MIN86)

BURIAL LOCATION	N	AFF	%
Western Cemetery	119	18	15.1%
Abbey Precinct	89	8	9.0%
Churchyard	*44*	*5*	*11.4%*
Abbey	*45*	*3*	*6.7%*
TOTAL	**208**	**26**	**12.5%**

Table 6.41: Crude Prevalence of Skull Fracture by Sex and Burial Location (MIN86)

BURIAL LOCATION	MALES			FEMALES			SUBADULTS		
	N	AFF	%	N	AFF	%	N	AFF	%
Western Cemetery	46	13	28.3%	28	4	14.3%	43	1	2.3%
Abbey Precinct	51	5	9.8%	14	1	7.1%	18	1	5.6%
Churchyard	*27*	*3*	*11.1%*	*7*	*1*	*14.3%*	*8*	*0*	*0.0%*
Abbey	*24*	*2*	*8.3%*	*7*	*0*	*0.0%*	*10*	*1*	*10.0%*
TOTAL	**97**	**18**	**18.6%**	**42**	**5**	**11.9%**	**61**	**2**	**3.3%**

Only two subadults presented with a skull fracture (3.3%). One presented with a depressed fracture near the lambda (11436) and the other presented with a fractured right maxillary lateral incisor (13887). However, there was one adult, a female from the western cemetery aged 36-45 (12648), with fractures that possibly occurred while she was a juvenile. She presented with compound fractures to the left maxilla and left nasal. This trauma, specifically a radiating fracture line across the alveolar and palatine processes, may have caused the left canine to become palatally impacted behind the lateral incisor (Brin *et al*., 1993; Lenstrup, 1955). It is likely that this injury occurred before she was eleven, and most likely between the ages of one and nine when the bud of the permanent

maxillary canine is present but has yet to erupt, and the root of the permanent lateral incisor has not fully formed (ibid; Gustafson and Koch, 1974).

There was a significant difference in the true prevalence of skull fractures, with the western cemetery exhibiting more injuries (1.3%: 20/1578) than the abbey precinct burials (0.4%: 4/1130; $\chi^2 = 5.258$, df = 1, p = 0.022, $\Phi_c = 0.04$; Table 5.42). However, the relationship was very weak. In terms of the individual skull elements, there were no distinct differences in the true prevalence of fracture between burial locations. In the western cemetery burials, the nasal was the most affected bone (12.2%: 5/41) followed by the occipital (4.1%: 4/98), the left frontal (2.8%: 3/106) and the left parietal (2.7%: 3/111; Table 6.42). The right parietal, both zygoma, and the maxillae were also affected. Although there were only four fractures, the location of skull fractures in the abbey precinct sample was different. Only the mandible (2.2%: 2/90) and the frontal bone (2.4%: 2/85) were affected (Table 6.42). Although more skull injuries occurred on the left side of the body (61.9%) than the right (38.1%), the difference was not statistically significant.

Table 6.42: True Prevalence of Skull Fractures by Skeletal Element and Burial Location (MIN86)

SKULL ELEMENT	WESTERN CEMETERY			ABBEY PRECINCT		
	N	AFF	%	N	AFF	%
L Frontal	106	3	2.8%	75	1	1.3%
R Frontal	106	0	0.0%	82	1	1.2%
L Parietal	111	3	2.7%	85	0	0.0%
R Parietal	108	2	1.9%	85	0	0.0%
Occipital	98	4	4.1%	92	0	0.0%
Nasal	41	5	12.2%	9	0	0.0%
L Zygomatic	79	1	1.3%	67	0	0.0%
R Zygomatic	77	1	1.3%	61	0	0.0%
L Maxilla	96	1	1.0%	62	0	0.0%
R Maxilla	96	0	0.0%	64	0	0.0%
Mandible	111	0	0.0%	90	2	2.2%
TOTAL	**1578**	**20**	**1.3%**	**1130**	**4**	**0.4%**

6.6.1.1.2.1 Cranial Vault Trauma

Twelve individuals presented with at least one fracture to the cranial vault, representing 5.8% (12/208) of the total population. Eleven of the individuals were buried in the western cemetery, while the other was buried in the abbey nave. This difference was statistically significant ($\chi^2 = 4.7724$, df = 1, $p = 0.029$, $\Phi_c = 0.15$). Nine of the individuals were male, two were female, and one was a subadult aged 12-17. Males from the western cemetery presented with the largest number of cranial vault fractures (17.4%: 8/46). A difference that was significantly greater than the males from the abbey precinct (2.0%: 1/51; Fisher's Exact: $p = 0.012$, $\Phi_c = 0.23$). See Table 6.43 for a full list of individuals affected by cranial vault trauma.

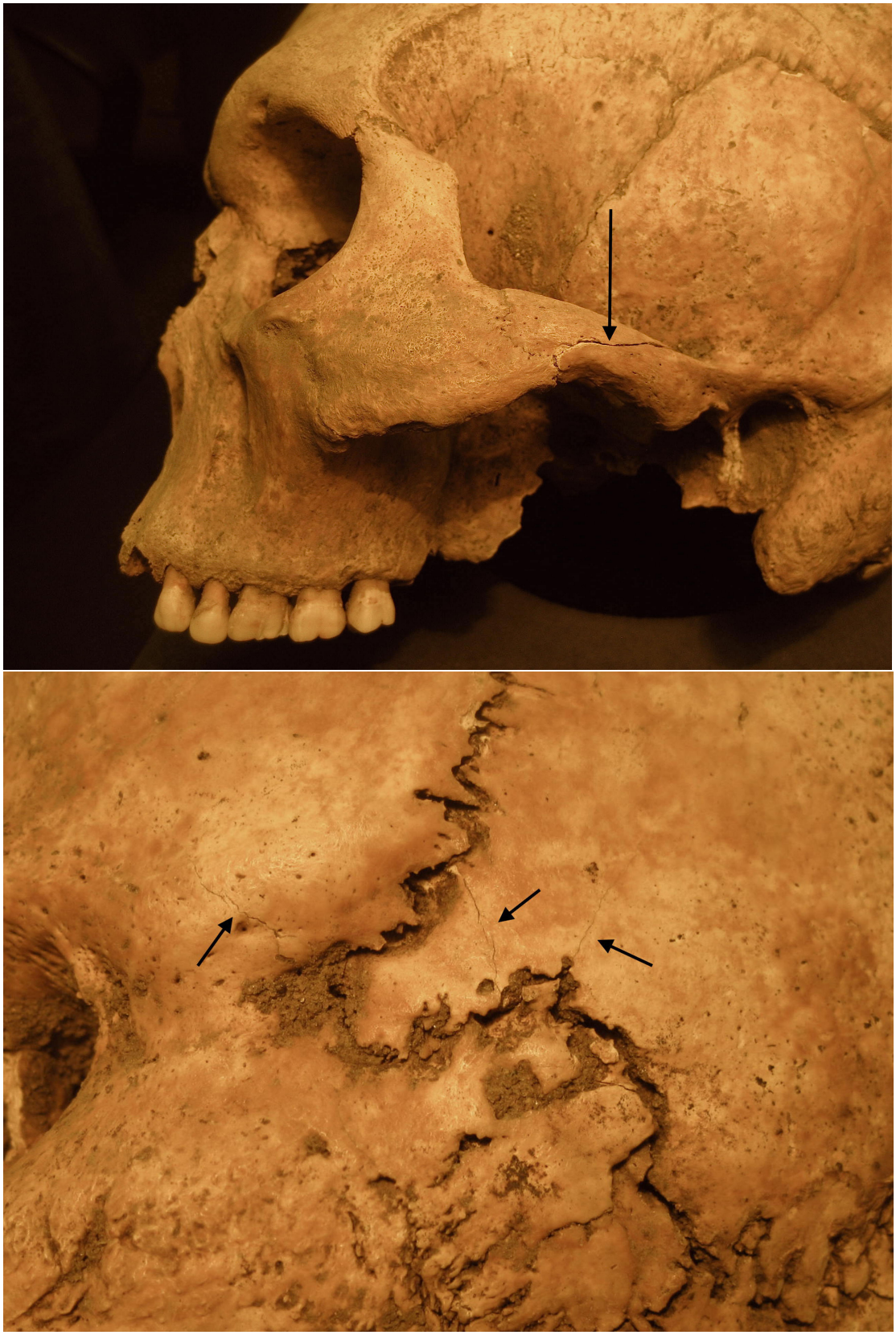
Table 6.43: List of Individuals with cranial vault trauma (MIN86)

CONTEXT #	BURIAL LOCATION	SEX	AGE	FRACTURE LOCATION	NOTES
6272	Western Cemetery	F	18-25	L occipital, R femur, 2 unknown T vertebrae	Occipital – puncture trauma
7102	Western Cemetery	M	>45	L frontal, L parietal, L nasal, L patella, L ulna, L radius	All skull fractures – BFT
7418	Western Cemetery	M	26-35	L frontal	Frontal – BFT
8102	Western Cemetery	M	36-45	Occipitomastoid suture, R zygomatic, L zygomatic, R nasal, L clavicle	All skull fractures – perimortem; suture – diastatic with microfracturing
9543	Western Cemetery	M	>45	L occipital and R rib	Occipital – BFT
9608	Western Cemetery	M?	36-45	R parietal	BFT
9810	Western Cemetery	M?	26-35	R parietal	SFT
11005	Western Cemetery	M	36-45	L parietal and L1	Parietal – perimortem BFT and puncture trauma
11436	Western Cemetery	SA	12-17	R occipital	BFT
12525	Western Cemetery	M	18-25	R occipital and R parietal	SFT – evidence of surgery
12664	Western Cemetery	F?	36-45	L frontal and L parietal	BFT
13622	Abbey Buildings	M	26-35	R frontal and L frontal	R frontal – SFT, L frontal - BFT

Blunt Force Trauma. The vast majority of cranial vault fractures present in the sample were indicative of blunt force trauma (75.0%: 9/12). One out of the nine affected individuals was a female, one was a subadult, and the rest were male (Table 6.43). Eight of the affected individuals were buried in the western cemetery and one was buried within the abbey church. The individual buried inside the abbey church, presented with one blunt force and one sharp force injury, both on the frontal. In terms of location, the left side of the frontal was the most affected with four individuals, the left parietal was the next most affected with three individuals. Two individuals each were affected by fractures to the right parietal and occipital. All blunt force injuries were greater than 5mm in diameter and above the hat-brim line, indicating that they are highly consistent with violence, altough accidental injury remains a possibility.

All but one of the injuries was fully healed. The exception, individual (8102), is a male, aged 36-45, buried in the western cemetery and of possible sub-Saharan African ancestry. He presented with a total of four fractures: a fully healed greenstick fracture to the clavicle and three perimortem fractures, one each to the right zygomatic, left zygomatic arch, and right nasal (Figure 6.25). Additionally, the left occipitomastoid suture was open with microfracturing around it, possibly suggesting a diastatic fracture caused by the forces of direct blunt force trauma. The multiplicity of facial injuries and the diastatic fracture are typical of violence. While an accidentally injury is possible, it would have taken a considerable amount of force to cause the diastatic fracture. Unfortunately, the specific risks this individual may have encountered are not known and specific accidental causes can therefore not be hypothesised.

Figure 6.25: Individual 8102, a male aged 36-45, presented with a fracture to the left zygomatic arch and a diastatic fracture to the left occipitomastoid suture with microfracturing. Both fractures are perimortem. The unpatinated appearance at the margin is postmortem damage. (MIN86)



Sharp Force Trauma. Three individuals, two from the western cemetery and one from within the abbey of St Mary Graces, presented with sharp force trauma to the skull. All of them were male. In two of the cases the injury was fully healed (one with evidence of surgery - 12525). In the last case, the injury was still in the process of healing at the time of death (9810). In one case (from the western cemetery -12525) the lesion fully penetrated the endocranium while the other two were superficial.

Individual 9810, a probable male aged 26-35 from the western cemetery, presented with sharp force trauma to the right parietal that was in the process of healing at the time of death (Figure 6.26). The cut mark measures approximately 37mm in length and stretches from the coronal suture across the right parietal. It does not penetrate the endocranium. While the kerf is obscured by signs of healing, it appears to be fairly straight and both walls of the injury are at an approximate 90° angle, indicating a perpendicular blow by a straight-bladed weapon. The anterior end of the lesion is slightly deeper than the posterior margin, suggestive of a frontal assault with a bladed weapon (if the individual's head was facing forward at the time). Neither the anterior or posterior margins are finite, indicating that the blade may have been longer than 37mm. Both knives and swords from medieval London appear to have longer blades than 37mm so either may have been the cause of this injury, but Lewis's (2008) finding on blade length may strengthen the argument in favour of sword. Overall, the injury is typical of violence. As someone who was buried in the western cemetery it is not known what inherent risks he may have faced other than those typical of medieval London life.

Figure 6.26: Individual 9810, a probable male aged 26-34 from the western cemetery presenting with a partially healed cut mark to the right parietal. (MIN86)



Individual 12525, a male aged 18-25 from the western cemetery, presented with possible sharp force trauma to the right side of the occipital and parietal. The lesion measures 50mm in length and 14mm at its widest point. There is evidence of tool markings around the margins of the lesion, possibly suggesting the use of surgery. The lesion is irregularly shaped, possibly due to uneven healing. As the lesion fully penetrates the endocranium the shape of the blade is unable to be determined. The length of the injury, however, is quite similar to the average medieval sword width as measured from four swords at the Museum of London (46mm). It should be noted, however, that while a piercing trauma from a sword may be possible, it is unlikely. Swords had a rounded blunt point for most of the medieval period until the pointed tip was developed at the end of the 14th century (Rimer, 2000: 120). This individual is dated to between 1350-1400, so

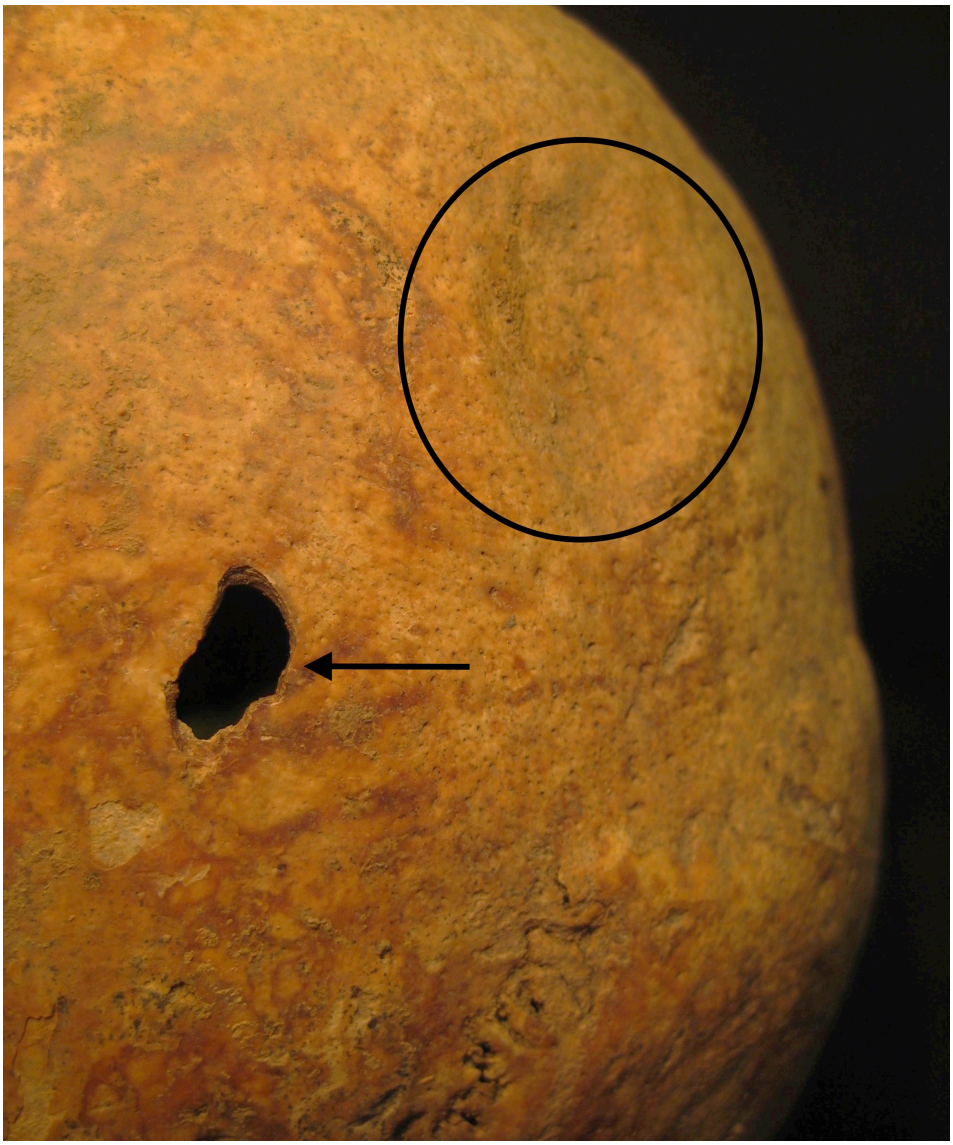
while it is possible that the piercing of a sword blade may have caused this injury, it is not definite that he would have been contemporary to this different weapons technology. Another possibly is a dagger or knife injury in which the margins of the wound were widened during surgery. All characteristics point to this injury being highly consistent with violence. The uncertainty of the weapon and the signs of surgery prevent this lesion from being typical of violence. As with above, this individual was buried in the western cemetery so it is not known what inherent risks he may have faced other than those typical of medieval London life.

One individual buried in the abbey of St Mary Graces, a male aged 26-35 (13622), presented with probable healed sharp force trauma to right side of the frontal bone, approximately 10mm from the supraorbital ridge. The cut mark does not fully penetrate the ectocranium, creating a ledge of bone. The lesion is 12mm in length. As the lesion is quite small and fully healed, it is uncertain what type of weapon may have caused such an injury, other that it was most likely a bladed weapon. Overall, the injury is high consistent with violence. This individual was buried in the abbey and it thus likely of high status and possibly a knight, as such it is likely he would have encountered bladed weapons quite frequently, either through battle practice and tournaments or through warfare.

Puncture Trauma. Two individuals presented with puncture trauma to the cranial vault, both were from the western cemetery: one perimortem and one antemortem (Table 6.43). Individual 11005, a male aged 36-45, presented with both antemortem blunt force trauma and perimortem kidney-shaped puncture

trauma (11005; Figure 6.27). Both injuries were to the left parietal. The healed depression fracture is approximately 30mm from the sagittal suture and 40mm from the lambdoidal suture, above the hat-brim line. It measures 18mm in length and 16mm in width. A small bulge appears on the endocranium. The puncture trauma is approximately 30mm from the lambdoidal suture and 60mm from the squamosal suture. It measures 10mm in length and 5mm in width. The margins are smooth and there is endocranial bevelling (Figure 6.28). There are no apparent radiating fractures.

Figure 6.27: Individual 11005, a male aged 36-45 from the western cemetery, presenting with a healed depression fracture and a perimortem puncture trauma. (MIN86)



Of note, is that there is a greater amount of endocranial bevelling on the left side of the puncture lesion than on the right. This evidence in combination with the fact that the wound is located on the left parietal near the lambdoidal suture, suggests that, if the head was in a frontal position at the time the injury took place, the weapon most likely came from behind and pierced the cranium at a leftward angle. If this injury was caused by a violent encounter, the attacker most likely struck their opponent from behind. The size and shape of the injury suggests a rounded instrument, possibly a bodkin arrowhead or rondel dagger. The lack of radiating fracture lines may indicate that the weapon struck the cranium at a relatively low velocity, lending credence to the fact that it may have been a dagger. In all, both the healed depression fracture and the perimortem puncture trauma are typical of violence. As with above, this individual was buried in the western cemetery so it is not known what inherent risks he may have faced other than those typical of medieval London life. So, it is not possible to provide a suggestion of what type of event may have caused this injury.

Individual 6272, a female aged 18-25 from the western cemetery, presented with healed puncture trauma to the left side of the occipital bone (Figure 6.29). There are two puncture holes present. The first lesion is approximately 30mm from the lambdoidal suture and measures 4mm in length and width. The second lesion is approximately 40mm from the lambdoidal suture and measures 10mm in length and width. There is a healed radiating fracture line between the two holes and another one radiating from the smaller lesion down towards the foramen magnum. There is evidence of unhealed infection around both lesions.

Figure 6.28: View of the endocranial bevelling of the puncture trauma seen on individual 11005. (MIN86)



The two different sizes of the lesions imply that either two different weapons of different widths were used, or, perhaps more likely, the same weapon was used but it penetrated the cranium deeper on the lesion to the right than the one of the left. If the latter is true, it is possible that the weapon was rounded and increased in width between the point and the handle-end of the blade. This shape is similar to the blade of a rondel dagger, which was popular during the 14th century when this individual lived, although any tapered, rounded object is also a possibility. The multiplicity of puncture lesions indicates that this injury is typical of violence. Specific causes of this injury are uncertain, as the inherent risks she may have faced are unknown.

Figure 6.29: Individual 6272, a female aged 18-25 from the western cemetery, presenting with two puncture lesions to the left side of the occipital. (MIN86)



6.6.1.1.2.2 Facial Trauma

Seven individuals presented with at least one fracture to the facial region. Five of the individuals were male and two were female. Six were buried in the western cemetery, while one was buried within the abbey, and the last was buried in the abbey churchyard. While the number of facial fractures was too small to be tested for significance, the overall numbers appear to show a similar trend to other fractures with the males from the western cemetery presenting with the

largest number (9.5%: 4/42). Table 6.44 provides a full list of individuals presenting with facial trauma.

Table 6.44: List of individuals with facial trauma (MIN86)

CONTEXT #	BURIAL LOCATION	SEX	AGE	FRACTURE LOCATION	NOTES
7102	Western Cemetery	M	>45	Nasal	
8102	Western Cemetery	M	36-45	R zygomatic, L zygomatic, R nasal, and L clavicle	Facial fractures - perimortem
9828	Western Cemetery	M	36-45	Nasal	
10493	Abbey Churchyard	F	NA	R mandible and C2	C2 – right anterior facet
11475	Western Cemetery	M	26-35	L nasal, R middle rib, T7, T8, and L mandibular M3	
12349	Abbey Building	M	36-45	Mandible	
12648	Western Cemetery	F	36-45	L maxilla and L nasal	Possibly juvenile in origin

In terms of location, five individuals presented with a fracture to the nasal bone, two individuals presented with fractures to the zygoma, and a further two individuals presented with fractures to the mandible. Only one individual presented with a fracture to the maxilla. Overall, these fractures are consistent with violence but an accidental aetiology remains a possibility. See Table 6.42 for results of true prevalence of skull fractures by element.

6.6.1.1.2.3 Dental trauma

Ten individuals presented with dental trauma. Of those nine individuals, seven were male (including individual 6351 shown in Figure 6.30), one female, one adult of undetermined sex, and one subadult aged 6-11. Five on the individuals were buried in the western cemetery, three were buried in the abbey churchyard, and one, the subadult, was buried in the nave of the abbey itself. Only one individual (11475) presented with a corresponding facial fracture, which many be highly consistent with violence. The rest are only consistent with

violence as other causes are also likely. Table 6.45 provides a full list of individuals presenting with dental trauma.

Figure 6.30: Individual 6351, a male aged 36-45, with a dental fracture to the left mandibular 1st molar. (MIN86)



Table 6.45: List of individuals with dental trauma (MIN86)

CONTEXT #	BURIAL LOCATION	SEX	AGE	FRACTURE LOCATION	NOTES
6351	Western Cemetery	M	36-45	L mandibular M1, T8, and L1	Enamel-dentin-pulp fracture: lingual side
7228	Western Cemetery	F	36-45	L mandibular M2 and L clavicle	Enamel-dentin fracture: mesial side
9425	Abbey Churchyard	M?	26-35	R mandibular canine	Enamel fracture
9662	Western Cemetery	M?	36-45	L mandibular canine, L ulna, L radius, L lunate, and L scaphoid	Enamel fracture
10058	Abbey Churchyard	M	18-25	R mandibular canine, R humerus, R clavicle, R ulna, L tibia, and L1	Enamel fracture
10287	Abbey Churchyard	M	36-45	L mandibular PM1 and M1, R patella, T6	Enamel fracture
11475	Western Cemetery	M	26-35	L mandibular M3, L nasal, R middle rib, T7, and T8	Enamel fracture: buccal side.
12185	Abbey Churchyard	NA	26-35	L maxillary M1	Enamel-dentin-pulp fracture: lingual side
12881	Western Cemetery	M	36-45	R maxillary I1	Enamel-dentin-pulp fracture: lingual side
13887	Abbey Buildings	SA	6-11	R maxillary I2	Enamel fracture

6.6.1.1.3 Rib Fractures

Ten individuals presented with at least one rib fracture. All of those affected were male, with a total of 9.3% (10/107) presenting with at least one fracture to the ribs. Half of the individuals presented with multiple rib fractures, all of which were adjacent. Three of the males affected were from the western cemetery (6.1%: 3/49) and seven were from abbey precinct (12.1%: 7/58). There was no significant difference between them in terms of crude prevalence (Table 6.46).

In terms of true prevalence, those buried within the abbey precinct presented with a higher number of rib fractures (1.7%: 12/704) than those buried in the western cemetery, the difference of which was not quite significant (0.6%; χ^2 = 3.2184, df = 1, p = 0.07, Φ_c = 0.05; Table 6.47). Additionally, while the individuals with rib fractures buried in the abbey churchyard (1.0%: 3/308) did not significantly differ from those buried in the western cemetery, those buried within the abbey church did (2.3%: 9/396; Fisher's Exact: p = 0.035, Φ_c = 0.07). However, the relationship was very weak. All rib fractures were fully healed except for one, which was still in the process of healing at the time of death. None of the individuals presented with pathologies that might have predisposed them to rib injury (see Brickley, 2005). A full list of individuals with rib fractures is found in Table 6.48 and potential causes for these injuries and the associated

Table 6.46: Crude Prevalence of Rib Fracture by Sex and Burial Location (MIN86)

BURIAL LOCATION	MALES		
	N	AFF	%
Western Cemetery	49	3	6.1%
Abbey Precinct	58	7	12.1%
Churchyard	*26*	*2*	*7.7%*
Abbey	*32*	*5*	*15.6%*
TOTAL	**107**	**10**	**9.3%**

Table 6.47: True Prevalence of Rib Fracture by Sex and Burial Location (MIN86)

Burial Location	Males		
	N	AFF	%
Western Cemetery	716	4	0.6%
Abbey Precinct	704	12	1.7%
Churchyard	*308*	*3*	*1.0%*
Abbey	*396*	*9*	*2.3%*
Total	**1420**	**16**	**1.1%**

risks are hypothesised in Chapter 8.

Table 6.48: List of individuals with rib fractures (MIN86)

CONTEXT #	BURIAL LOCATION	SEX	AGE	FRACTURE LOCATION	NOTES
7223	Western Cemetery	M	36-45	2 L ribs	Transverse; adjacent ribs
9543	Western Cemetery	M	>45	R rib and L occipital	Transverse
10164	Abbey Churchyard	M?	NA	R lower rib	Greenstick?
10231	Abbey Churchyard	M	26-35	2 left ribs and T10	Greenstick; unable to determine adjacency
11475	Western Cemetery	M	26-35	R middle rib, L nasal, T7, T8, and L mandibular M3	Transverse
12450	Abbey Buildings	M	>45	L rib	Transverse
12493	Abbey Buildings	M	>45	2 left ribs, 5th MT, and T5	Transverse; adjacent ribs
13663	Abbey Buildings	M	>45	3 R middle ribs	Transverse, Oblique, Greenstick?
13840	Abbey Buildings	M	36-45	L rib, T9 and L1	Oblique; in process of healing
16332	Abbey Buildings	M	NA	2 unsided upper ribs	Transverse, Oblique; non-adjacent

6.6.1.1.4 Parry Fractures?

Two individuals had possible parry fractures to the left ulna. One was a probable male of undetermined age (12757) from the western cemetery, who presented with a transverse fracture to the distal third of the diaphysis. The fracture was well-healed with only minor callus formation. He did not present with any other fractures, accidental or violence-related. The other was a female, aged >45, from the western cemetery (9334) who presented with a possible transverse fracture to the distal third of the right ulna as well as a compression fracture to the T6 vertebrae. Overall, both injuries are consistent with violence.

6.6.1.1.5 Post-Cranial Puncture, Projectile, and Sharp Force Trauma

Three individuals presented with either post-cranial puncture, projectile or sharp force trauma. One individual, a probable female whose age could not be

determined (7367) presented with a perimortem puncture injury to her right fibula (Figure 6.31). The centre of the lesion measures 5mm in diameter and there is a ring of adhering bone around the injury. As this injury was unlikely to be fatal, it is probable that she sustained other injuries to other parts of her body. Unfortunately, this skeleton was truncated and only her pelvis, lower limbs, and fragments of the vertebrae and ribs survived.

Figure 6.31: Individual 7367, a probable female from the western cemetery, presenting with unhealed puncture trauma to the right fibula. **(**MIN86)



The shape of the injury is flat, indicating that she was likely pierced by a flat-bladed weapon with a sharp point. This may indicate that a knife/dagger, sword, spearhead, or arrowhead may have been the weapon as some types of all these weapons had flat, pointed blades during the medieval era. However, as this individual died sometime between 1350 and 1400, a spearhead may have been unlikely as this type of weapon stopped being population in England during the 13th century (Swanton, 2003). The characteristics of this injury are highly

consistent with violence. Specific causes of this injury are uncertain, as the inherent risks she may have faced are unknown.

Another individual, a male aged older than 45 (7314), presented with a healed projectile trauma to the vertebral column, with the head of the arrow remaining imbedded in the spinous process of his fifth thoracic vertebra. The arrowhead was only partially visible and was quite rusted so, unfortunately, the type of arrowhead was unable to be determined without a CT scan. This injury is typical of violence with the only other possibility being accidentally shot with an arrow, instead of intentionally. Specific causes of this injury are uncertain, as the inherent risks he may have faced are unknown.

There was one individual, buried within the presbytery of the abbey church, who presented with sharp force trauma to the postcranial skeleton. Several sharp force lesions were observed on the anterior surface of the C5 centrum (16052; Figure 6.32). The presence of two hinge fractures may indicate that there was more than one blow and the lack of sharp force trauma to the anterior end of the centrum suggests that the blade struck from the posterior of the neck. This type of injury is suggestive of a decapitation. The skull and the C1-4 vertebrae were not discovered during the course of excavation, perhaps suggesting that the head was completely removed from the body and not buried with it. This type of injury is typical of violence, although in this case it may have been state-sanctioned violence. The causes of this injury are further elaborated on in Chapter 8.

Based on this individual's burial location close to the high altar and the evidence of decapitation, it is possible that this individual was Sir Simon Burley who was a close friend and advisor to Edward, the Black Prince (Grainger and Phillpotts, 2011). He was executed for treason by the Merciless Parliament on May 5, 1388 and buried in the abbey of St Mary Graces (Higden, 1886: 177; Lewis, 1937: 668-9). No other execution victim is known to have been buried there.

Figure 6.32: Individual 16052, a male buried in the nave of the abbey, presenting with perimortem sharp force trauma to the C5 vertebra. (MIN86)



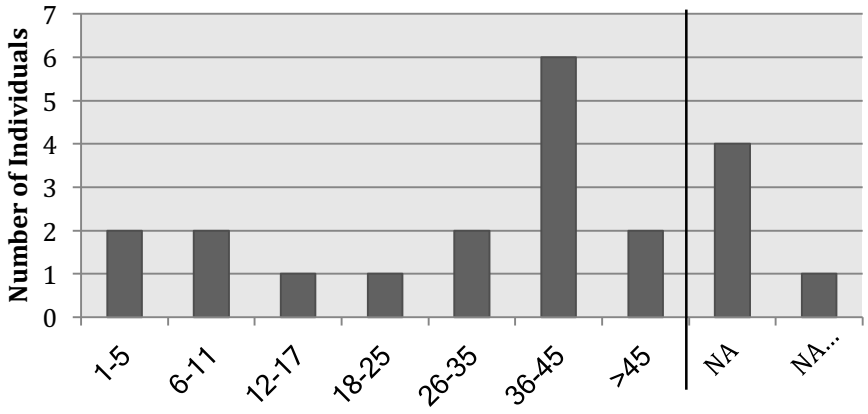
5.7 ST BENET SHEREHOG (ONE94)

A total of 21 skeletons were analysed from the site of St Benet Sherehog (ONE94) and were roughly dated to between 1250 and 1666. The sex ratio was 1.4:1, with more males present than females (Table 6.49). There was no distinct pattern seen regarding the number of individuals and their estimated age-at-death (Figure 6.33). However, there was a distinct peak in the number of individuals with an estimated age of 36-45. The overall numbers were quite small, making it difficult to determine any differences between the sexes in terms of age distribution (Table 6.50).

Table 6.49: Number of Individuals by Sex (ONE94)

SEX	N	% OF TOTAL
Males	7	33.3%
Intermediates	0	0.0%
Females	5	23.8%
NA	3	14.3%
Subadults	6	28.6%
TOTAL	**21**	**100.0%**

Figure 6.33: Number of Individuals by Age (ONE94)



NA and NA Subadult are the classifications for adults and subadults whose age could not be determined

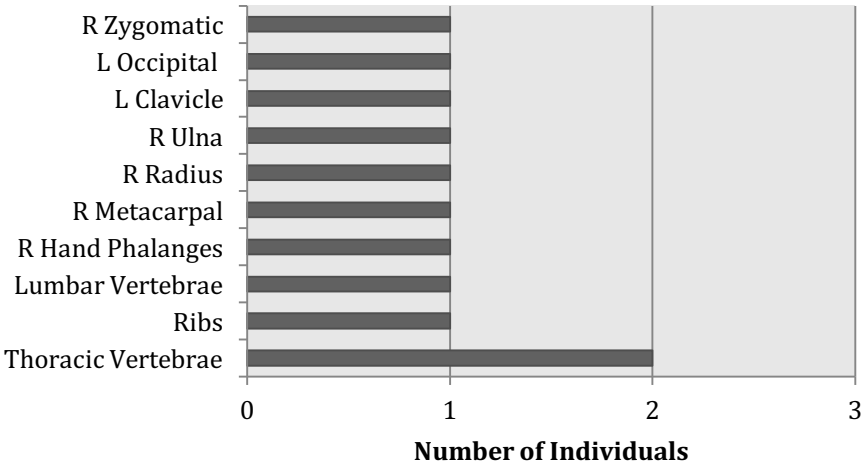
Table 6.50: Number of Adults by Sex and Age (ONE94)

AGE	TOTAL	MALES		INTERMEDIATES		FEMALES		UNKNOWNS	
	N	N	%	N	%	N	%	N	%
18-25	1	0	0.0%	0	0.0%	1	100.0%	0	0.0%
26-35	2	2	100.0%	0	0.0%	0	0.0%	0	0.0%
36-45	6	4	66.7%	0	0.0%	2	33.3%	0	0.0%
>45	2	1	50.0%	0	0.0%	1	50.0%	0	0.0%
NA	4	0	0.0%	0	0.0%	1	25.0%	3	75.0%
TOTAL	**15**	**7**	**46.7%**	**0**	**0.0%**	**5**	**33.3%**	**3**	**20.0%**

6.7.1 TRAUMA

In the St Benet Sherehog (ONE94) collection, six individuals presented with at least one fracture, representing 28.6% (6/21) of the total population. There was a total of 16 fractures between those six individuals. Three individuals presented with two or more fractures. One individual, a probable female aged >45 (864), presented with eight fractures, all to her right hand and lower arm. Another individual, a probable male aged 36-45 (1601), had three fractures: one compression fracture to the L2 centrum and two rib fractures to two separate, unsided, ribs. One individual presented with two fractures, a female, aged 36-45 (1511), with one fracture to the right zygomatic and another to the left occipital. In terms of location on the body the thoracic vertebrae had the greatest number of fractures with two. All other fractures were found at various locations on the body and no individual presented with a fracture at the same location. Figure 6.34 shows the full distribution of fractures by location. No individuals presented with dislocations or *myositis ossificans traumatica*.

Figure 6.34: Number of Individuals with Fractures by Location (ONE94)



The crude prevalence for fracture for this collection was rather high. Adults of undetermined sex presented with the highest percentage of fractures with 66.7% (2/3) affected. Females were the most affected sex, representing 60.0% (3/5) of their total. Males were the least affected with only 14.3% (1/7) of individuals presenting with at least one fracture. However, the overall numbers were low and no significant difference between the sexes was detected. Table 6.51 shows the full distribution of fractured individuals by sex.

Adults of undetermined age had the highest proportion of fracture between the age groups with 75.0% (3/4) affected. Adults aged >45 were next with 50.0% (1/2), followed by adults aged 36-45 with 33.3% (2/6). No adults aged younger than 36 or subadults of any age presented with fractures. The numbers in this collection were too small to determine any statistically significant differences or patterns. Table 6.51 shows the full distribution of fractured individuals by age group.

Table 6.51: Crude Prevalence of All Fractures by Sex and Age (ONE94)

AGE	MALES			INTERMEDIATES			FEMALES			UNKNOWNS			SUBADULTS			TOTAL		
	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%
Perinatal	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
1-6m	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
7-11m	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
1-5	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0.0%	**2**	**0**	**0.0%**
6-11	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0.0%	**2**	**0**	**0.0%**
12-17	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0.0%	**1**	**0**	**0.0%**
18-25	0	0	0.0%	0	0	0.0%	1	0	0.0%	0	0	0.0%	-	-	-	**1**	**0**	**0.0%**
26-35	2	0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%	-	-	-	**2**	**0**	**0.0%**
36-45	4	1	25.0%	0	0	0.0%	2	1	50.0%	0	0	0.0%	-	-	-	**6**	**2**	**33.3%**
>45	1	0	0.0%	0	0	0.0%	1	1	100.0%	0	0	0.0%	-	-	-	**2**	**1**	**50.0%**
NA	0	0	0.0%	0	0	0.0%	1	1	100.0%	3	2	66.7%	-	-	-	**4**	**3**	**75.0%**
SA NA	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0.0%	**1**	**0**	**0.0%**
TOTAL	**7**	**1**	**14.3%**	**0**	**0**	**0.0%**	**5**	**3**	**60.0%**	**3**	**2**	**66.7%**	**6**	**0**	**0.0%**	**21**	**6**	**28.6%**

Table 6.52: Crude Prevalence of VRI by Sex and Age (ONE94)

AGE	MALES			INTERMEDIATES			FEMALES			UNKNOWNS			SUBADULTS			TOTAL		
	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%
Perinatal	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
1-6m	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
7-11m	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0.0%	**0**	**0**	**0.0%**
1-5	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0.0%	**2**	**0**	**0.0%**
6-11	-	-	-	-	-	-	-	-	-	-	-	-	2	0	0.0%	**2**	**0**	**0.0%**
12-17	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0.0%	**1**	**0**	**0.0%**
18-25	0	0	0.0%	0	0	0.0%	1	0	0.0%	0	0	0.0%	-	-	-	**1**	**0**	**0.0%**
26-35	2	0	0.0%	0	0	0.0%	0	0	0.0%	0	0	0.0%	-	-	-	**2**	**0**	**0.0%**
36-45	4	1	25.0%	0	0	0.0%	2	1	50.0%	0	0	0.0%	-	-	-	**6**	**2**	**33.3%**
>45	1	0	0.0%	0	0	0.0%	1	1	100.0%	0	0	0.0%	-	-	-	**2**	**1**	**50.0%**
NA	0	0	0.0%	0	0	0.0%	1	0	0.0%	3	0	0.0%	-	-	-	**4**	**0**	**0.0%**
SA NA	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0.0%	**1**	**0**	**0.0%**
TOTAL	**7**	**1**	**14.3%**	**0**	**0**	**0.0%**	**5**	**2**	**40.0%**	**3**	**0**	**0.0%**	**6**	**0**	**0.0%**	**21**	**3**	**14.3%**

5.7.1.1 VIOLENCE-RELATED INJURIES

Three out of the eight individuals with fractures from St Benet Sherehog (ONE94) had trauma in a location that indicates it may have been violence-related, representing 14.3% (3/21) of the total population (Table 6.52). There was a total of 13 fractures between these three individuals, although not all were violence-related. All individuals presented with two or more fractures. The individuals with multiple fractures are the same as highlighted in the above section. A full list of individuals presenting with possible VRI are shown in Table 6.53.

Table 6.53: Individuals with Possible VRI (ONE94)

Context #	Sex	Age	# of Fractures	Location	Notes
864	F?	>46	8	Right ulna; right radius; right 2nd-4th metacarpals; right 2nd-4th proximal phalanges	
1511	F	36-45	2	Right zygomatic; left occipital	Occipital fracture in the process of healing
1601	M?	36-45	3	L2 centrum; 2 ribs - side unknown	Ribs are non-union, transverse fractures

In relation to true prevalence of violence related trauma, the right zygomatic was the most affected with 3.6% (1/28). The occipital was the next most affected bone with 3.3% (1/30) displaying at least one fracture. The metacarpals had a true prevalence of 1.7% (3/180) and the ribs, 0.3% (2/662).

Two females were affected by possible violence-related injuries, representing 40.0% (2/5) of all females. A probable male was the only other individual to present with a possible VRI, representing 14.3% (1/7) of the male population. No intermediate adults, adults of undetermined sex, or subadults presented with VRI. The statistical significance of these differences could not be determined due

to the low numbers in the overall collection. A full distribution of VRI by sex is shown in Table 6.48.

Adults aged >45 presented with the highest proportion of possible VRI with 50.0% (1/2) affected. They were followed by adults aged 36-45 with 33.3% (2/6) affected. No adults younger than 36, adults of undetermined age, or subadults presented with possible VRI. The statistical significance of these differences could not be determined for the same reasons as above. A full distribution of VRI by age group is shown in Table 6.48.

6.7.1.1.1 Skull Trauma

Only one individual presented with fractures to the skull: a female aged 36-45 (1511). She presented with a linear fracture to the left side of the occipital, below the hat-brim line, that was still in the process of healing. She also presented with a well-healed fracture to the right zygomatic. Both injuries were at different stages of healing indicating that they most likely occurred at different times. The location and type of fracture to the occipital is suggestive of an accidental injury and not consistent with violence, but a zygomatic fracture is consistent with violence. As this site interred many wealthy craftsmen and traders of London, she is unlikely to have faced many inherent risks, except for perhaps domestic abuse or assault while travelling in and out of London (see Chapter 4, Section 4.6.1.2).

6.7.1.1.2 Rib Fractures

One individual presented with rib fractures, a probable male, aged 36-45 (1601). This individual presented with two transverse fractures; they were non-adjacent but the siding is unknown. Both fractures were to the sternal end of the rib and both healed ununited. The similarity in location and type of injury may suggest that they occurred at the same time. The pattern and characteristics of these fractures are consistent with violence but accidental injury from falling onto a blunt object, which may have been common on the uneven streets of London, remains a possibility.

6.7.1.1.3 Metacarpal Fractures

One individual, a probable female aged >46 (864), had eight fractures all to the right hand and arm: one each to the distal third of the right ulna and right radius, as well as one each to the right 2nd, 3rd, and 4th metacarpals and the right 2nd, 3rd, and 4th proximal hand phalanges. The fractures to the metacarpals and hand phalanges were all malaligned and resulted in both palmar and dorsal angulation of the various diaphyses as well as fusion of the 3rd and 4th metacarpals (as shown in Figure 6.35). These injuries most likely all occurred as one event as they are close in proximity and display a specific fracture pattern.

The fracture pattern is angled. It first affected the distal end the 2nd hand phalanx, then the proximal end of the 3rd hand phalanx, and then the distal end of the 3rd metacarpal. The next fracture occurs at the proximal end of the 4th metacarpal. There is also a joint fracture to the 4th metacarpal and the 4th proximal hand phalanx. This angular pattern is mirrored in the fractures to the

lower arm bones, with the oblique fracture to the right radius occurring 40mm from the distal end and the oblique fracture to the right ulna occurring 50mm from the distal end. These two separate fracture "lines" are approximately 70mm apart and the angles of the "lines" are virtually identical. Because of this similarity in angle, the author would argue that is unlikely that this is the result of two separate blows from a weapon. Instead, these injuries may have been caused by an object with two "bars" approximately 70mm apart, striking or running over the hand and wrist. What this object is exactly is uncertain even when assessing the risks she may have been prone to, which would have been minimal considering her likely status.

Figure 6.35: Individual 864, a probable female aged older than 45 that presented with multiple fractures to the right hand phalanges and metacarpals. (ONE94)



6.8 CONCLUSIONS

Seven skeletal collections from medieval London, dating from 1050-1550, have been assessed individually for both demography and the presence of trauma,

focusing particularly on trauma most likely caused by violence. In terms of the demography, the sex ratios were fairly similar between the collections, with the exception that the monastic sites (i.e. St Mary Spital, St Mary Graces, and London Blackfriars), interred slightly more males than females. However, in comparison to other medieval monastic sites[52], the sex ratios suggest that there is still a relatively large lay population buried within these sites. Regarding age-at-death profiles, we do see a slight difference between the collections, with the majority of collections having a peak age-at-death between 36-45. The two exceptions to this are the St Mary Spital (SRP98) and London Blackfriars (PIC87) sites, which have a peak age-at-death of 26-35. Additionally, in every collection the male peak age-at-death was one age group younger than the females. So, in the majority of collections the male peak age-at-death was 36-45, but for females it was >45. For St Mary Spital and Blackfriars, however, who had younger age-at-death profiles, the male age-at-death peaked at 26-35 and the female one at 36-45. These discrepancies should be taken into account when comparing the different collections as this difference could perhaps affect the overall fracture frequency, especially since fractures tend to accumulate with age.

The overall presence of fractures ranged from as high as 28.6% in the St Benet Sherehog (ONE94) collection to 13.3% in the St Lawrence Jewry (GYE92) collection. In terms of violence-related trauma, St Benet Sherehog also had the highest prevalence with 14.3% of the total population affected. Blackfriars (PIC87) presented with the lowest prevalence of VRI, with 5.4% affected.

[52] For example, in the Bermondsey Abbey site no females were discovered and at Merton Priory the sex ratio was 9.6:1, with more males than females (Museum of London data downloads).

Regarding the severity of VRI in the collections, St Nicholas Shambles (GPO75) and St Mary Graces (MIN86) had the highest proportions of unhealed trauma as well as some of the most cranial-facial trauma. However, in terms of both overall fracture prevalence as well as VRI prevalence, they were also the only collections that demonstrated a distinct difference between the sexes as well as between adults and subadults. A complete comparison between the difference skeletal assemblages will be carried out in the next chapter.

CHAPTER 7: RESULTS OF THE COMBINED COLLECTIONS

In this chapter, the skeletal collections are collated and assessed for the presence of trauma. The combined data are analysed in relation to sex, age, burial location (i.e. monastic versus lay cemeteries), and time period. Additionally, the presence of trauma in each skeletal collection is compared with the others in order to investigate any similarities or differences between them. Skull, rib, and metacarpal fractures potentially indicative of violence (as identified in the previous chapter) are particularly highlighted. Statistical tests were employed using the criteria outlined in the methods section. The source of a statistically significant result was determined by comparing the standardised residuals, whereby anything greater than or equal to ±1.98 was considered significant.

7.1 ALL FRACTURES

The total crude prevalence of fractures for all of the analysed collections combined was 21.1% (1303/6164; Table 7.1). When the frequency of bone fractures for each individual collection was compared, no statistically significant differences were found ($\alpha = 0.05$).

Table 7.1: Crude Prevalence of Fracture by Collection

COLLECTION	N	AFF	%
St Nicholas Shambles (GPO75)	218	57	26.1%
St Lawrence Jewry – Guildhall Yard (GYE92)	60	8	13.3%
St Mary Spital - Spital Square (NRT85)	48	8	16.7%
St Mary Spital (SRP98)	5400	1130	20.9%
Blackfriars – Carter Lane (PIC87)	56	9	16.1%
St Mary Graces (MIN86)	361	85	23.5%
St Benet Sherehog (ONE94)	21	6	28.6%
TOTAL	**6164**	**1303**	**21.1%**

N = total number of individuals, AFF = number of individuals presenting with at least one fracture

The true prevalence of fractures for the combined collections was 0.3% (2383/683357; Table 7.2). The difference between the collections was statistically significant ($\chi^2 = 96.807$, df = 6, $p < 0.001$, $\Phi_c = 0.01$). The standardized residuals indicate that St Nicholas Shambles (GPO75), St Mary Graces (MIN86), and St Benet Sherehog (ONE94) all had a greater number of fractures relative to the other sites. Conversely, St Mary Spital (SRP98) and St Lawrence Jewry (GYE92) had a lower number of fractures than the other sites. However, the low value of phi suggests that these relationships are very weak.

Table 7.2: True Prevalence of Fracture by Collection

COLLECTION	ELEMENT COUNT	# OF FRACTURES	%
St Nicholas Shambles (GPO75)	12744	96	0.8%
St Lawrence Jewry – Guildhall Yard (GYE92)	6669	10	0.2%
St Mary Spital - Spital Square (NRT85)	6773	15	0.2%
St Mary Spital (SRP98)	616245	2077	0.3%
Blackfriars – Carter Lane (PIC87)	6283	17	0.3%
St Mary Graces (MIN86)	32297	153	0.5%
St Benet Sherehog (ONE94)	2346	16	0.7%
TOTAL	**683357**	**2384**	**0.3%**

BONE COUNT = number of bones in each skeleton with at least 2/3 present; # OF FRACTURES = total number of fractures per bone

7.1.1 SEX DIFFERENCES

There was a statistically significant difference between the total number of males and females presenting with at least one bone fracture ($\chi^2 = 62.201$, df = 1, $p < 0.001$, $\Phi_c = 0.12$; Table 7.3). When the St Mary Spital (SRP98) data were omitted the difference was still statistically significant ($\chi^2 = 7.5913$, df = 1, $p = 0.006$, $\Phi_c = 0.14$) and the relationship was stronger. However, when analysed individually, the only collection in which the number of fractures between males and females was statistically significant was St Mary Spital (SRP98; $\chi^2 = 52.741$, df = 1, $p < 0.001$, $\Phi_c = 0.11$; Table 7.3, Figure 7.1). This relationship between the sexes is

further exacerbated by the fact that males had a younger age-at-death profile than females, and hence had a shorter amount of time to accumulate fractures.

Table 7.3: Fracture Crude Prevalence by Sex

COLLECTION	MALES			FEMALES		
	N	AFF	%	N	AFF	%
St Nicholas Shambles (GPO75)	53	24	45.3%	60	17	28.3%
St Lawrence Jewry – Guildhall Yard (GYE92)	14	5	35.7%	18	2	11.1%
St Mary Spital - Spital Square (NRT85)	20	4	20.0%	7	3	42.9%
St Mary Spital (SRP98)	2238	674	30.1%	1889	381	20.2%
Blackfriars – Carter Lane (PIC87)	16	5	31.3%	12	3	25.0%
St Mary Graces (MIN86)	135	58	43.0%	67	16	23.9%
St Benet Sherehog (ONE94)	7	1	14.3%	5	3	60.0%
TOTAL	**2483**	**771**	**31.1%**	**2058**	**425**	**20.6%**

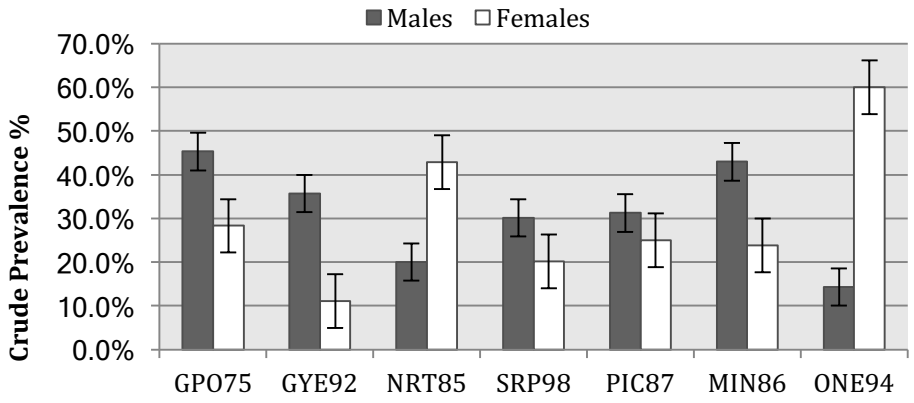


Figure 7.1: Crude Prevalence of Adult Fracture by Sex

There was a statistically significant difference between the males from each collection, although the relationship was very weak (Fisher's Exact: $p = 0.01$, $\Phi_c = 0.08$; Table 7.3). The standardised residuals show that the males from the St Nicholas Shambles (GPO75) and St Mary Graces (MIN86) collections had a greater number of bone fractures relative to other sites. Males from St Mary Spital (SRP98), on the other hand, presented with a lower number of bone fractures relative to other collections, although this may be due to their younger age-at death profile. The difference between females approached significance with females from St Benet Sherehog (ONE94) presenting with a greater number of fractures relative to other collections, and females from St Mary Spital

Table 7.4: Crude Prevalence of Fractures by Age Group and Collection

AGE (YEARS)	St Nicholas Shambles (GPO75)			St Lawrence Jewry (GYE92)			Spital Square (NRT85)			Blackfriars (PIC87)			St Mary Graces (MIN86)			St Benet Sherehog (ONE94)		
	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%
6-11	8	0	0.0%	9	0	0.0%	2	0	0.0%	2	0	0.0%	28	1	3.6%	2	0	0.0%
12-17	13	3	23.1%	3	0	0.0%	8	1	12.5%	4	0	0.0%	23	2	8.7%	1	0	0.0%
18-25	17	8	47.1%	7	0	0.0%	8	2	25.0%	5	2	40.0%	33	9	27.3%	1	0	0.0%
26-35	33	13	39.4%	10	3	30.0%	7	2	28.6%	11	2	18.2%	56	17	30.4%	2	0	0.0%
36-45	52	16	30.8%	11	3	27.3%	8	0	0.0%	9	2	22.2%	68	31	45.6%	6	2	33.3%
>45	23	11	47.8%	6	2	33.3%	5	3	60.0%	7	1	14.3%	40	13	32.5%	2	1	50.0%
ADULT	32	6	18.8%	9	0	0.0%	4	0	0.0%	15	2	13.3%	69	12	17.4%	4	3	75.0%

Table 7.5: Fracture Crude Prevalence by Age Group without SRP98

AGE (YEARS)	N	AFFECTED	%
6-11	51	1	2.0%
12-17	52	6	11.5%
18-25	71	21	29.6%
26-35	119	37	31.1%
36-45	154	54	35.1%
>45	83	31	37.3%
ADULT	133	23	17.3%

Table 7.6: Fracture Crude Prevalence by Age Group with SRP98

AGE (YEARS)	N	AFFECTED	%
6-11	400	8	2.0%
12-17	599	32	5.3%
18-25	1052	145	13.8%
26-35	1669	422	25.3%
36-45	1374	456	33.2%
>45	524	179	34.2%
ADULTS	347	62	17.9%

Table 7.7: Crude Prevalence of Fracture for St Mary Spital (SRP98)

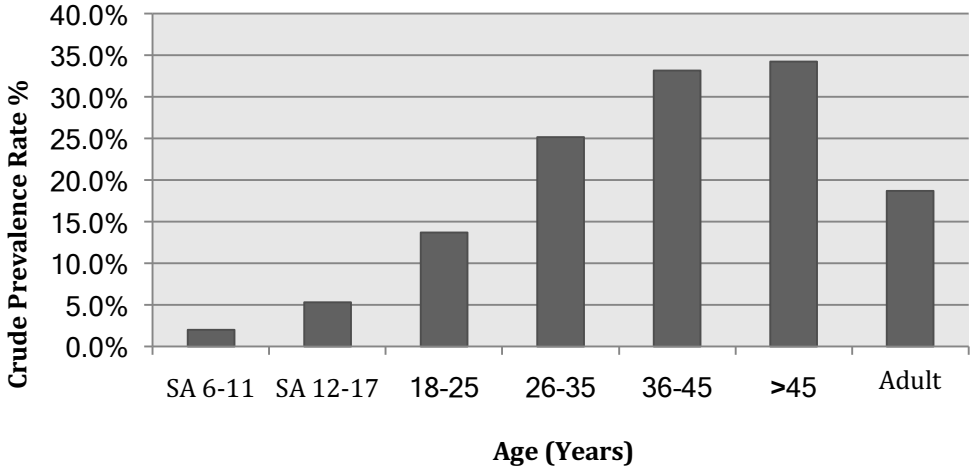
AGE	PERIOD 14			PERIOD 15			PERIOD 16			PERIOD 17			TOTAL		
(YEARS)	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%	N	AFF	%
6-11	21	1	4.8%	103	1	1.0%	188	3	1.6%	37	2	5.4%	349	7	2.0%
12-17	61	1	1.6%	170	6	3.5%	266	17	6.4%	50	2	4.0%	547	26	4.8%
18-25	82	6	7.3%	264	33	12.5%	508	70	13.8%	127	15	11.8%	981	124	12.6%
26-35	150	36	24.0%	401	93	23.2%	816	201	24.6%	183	55	30.1%	1550	385	24.8%
36-45	132	34	25.8%	302	102	33.8%	647	201	31.1%	139	65	46.8%	1220	402	33.0%
>45	39	10	25.6%	95	33	34.7%	246	86	35.0%	62	18	29.0%	441	148	33.6%
ADULT	13	2	15.4%	32	7	21.9%	115	25	21.7%	14	5	35.7%	214	39	18.2%

(SRP98) presenting with less (Fisher's Exact Test: $p = 0.083$, $\Phi_c = 0.07$; Table 7.3). Once again, the lower number of fractures in the St Mary Spital site may be due to the younger age-at-death profile. St Benet Sherehog (ONE94) and Spital Square (NRT85) were the only collections in which more females were affected by fractures than males, although the numbers were low in both instances and, therefore, were not significant.

7.1.2 AGE DIFFERENCES

The combined data, as would be expected, reveals an accumulation of fractures with increased age that is statistically significant ($\chi^2 = 385.97$, $df = 5$, $p < 0.001$, $\Phi_c = 0.26$; Figure 7.2). The relationship is particularly strong.

Figure 7.2: Crude Prevalence of Fracture by Age Group



Both subadult age groups and adults aged 18-25 presented with a lower number of fractures relative to other age groups. Adults aged 26-35, 36-45 and adults aged older than 45 all presented with a greater number of fractures relative to the other age groups. There was a significant increase in the frequency of bone fractures between subadults and the youngest adult age group (18-25), and again between adults aged 18-25 and 26-35 years. However, the rate of increase

slowed substantially by late adulthood (Figure 7.2). Between the collections, there were no statistically significant differences in subadult fractures (Table 7.8).

Table 7.8: Fracture Crude Prevalence of Subadults

COLLECTION	N	AFF	%
St Nicholas Shambles (GPO75)	61	3	4.9%
St Lawrence Jewry (GYE92)	17	0	0.0%
Spital Square (NRT95)	16	1	6.3%
St Mary Spital (SRP98)	1033	33	3.2%
London Blackfriars (PIC87)	9	0	0.0%
St Mary Graces (MIN86)	95	3	3.2%
St Benet Sherehog (ONE94)	6	0	0.0%
TOTAL	**1237**	**40**	**3.2%**

7.1.3 DIFFERENCES IN CEMETERY TYPE

The skeletal collections were sorted into two categories: parish/lay cemeteries and monastic cemeteries (Table 7.9). The St Mary Spital (SRP98) and Spital Square (NRT85) collections were omitted in this analysis, as they interred a more diverse population, including both monastic and lower status lay burials (see Chapters 4 and 5). Besides the western cemetery of the St Mary Graces (MIN86) collection, which is categorized separately in this section, the other monastic cemeteries consisted predominately of monastic and higher status, aristocratic, lay burials (see Chapters 4 and 5).

Table 7.9: Fracture Crude Prevalence by Cemetery Type

COLLECTION	CATEGORY	%
St Benet Sherehog (ONE94)	LAY	28.6%
St Nicholas Shambles (GPO75)	LAY	26.6%
St Mary Graces (MIN86) – MONASTIC	MONASTIC	23.6%
St Mary Graces (MIN86) – CATASTROPHE	LAY	23.5%
St Mary Spital (SRP98)	*MONASTIC HOSPITAL*	*20.9%*
St Lawrence Jewry (GYE92)	LAY	20.0%
London Blackfriars (PIC87)	MONASTIC	17.9%
Spital Square (NRT85)	*MONASTIC HOSPITAL*	*16.7%*

While the lay cemeteries combined had a higher crude prevalence rate than the monastic cemeteries, the difference was not statistically significant (Table 7.10). There was no significant difference in fracture crude prevalence between males from the lay sites and those from monastic sites (Table 7.10). The same was true of females. Interestingly, while there was no statistically significant difference between males and females in the monastic sites there was a significant difference between males and females in the lay sites ($\chi^2 = 7.2691$, df = 1, p = 0.007, $\Phi_c = 0.17$; Table 7.10). The two categories had similar age-at-death profiles so demography does not appear to be a complication.

Table 7.10: Individual Crude Prevalence by Cemetery Type

COLLECTION	MALES			FEMALES			TOTAL		
	N	AFF	%	N	AFF	%	N	AFF	%
Monastic	90	34	37.8%	39	8	20.5%	230	50	21.7%
Lay	135	59	43.7%	123	33	26.8%	486	115	23.7%
TOTAL	**225**	**93**	**41.3%**	**162**	**41**	**25.3%**	**716**	**165**	**23.0%**

7.2 SKULL FRACTURES

The combined crude prevalence of skull fractures (including the cranial vault, maxillofacial region, and dentition) was 4.3% (209/4882; Table 7.11) and the true prevalence was 0.5% (258/51398; Table 7.12). In terms of crude prevalence, there was a statistically significant difference between the collections (Fisher's Exact Test: $p < 0.001$, $\Phi_c = 0.11$). When comparing the standardised residuals, St Nicholas Shambles (GPO75), Spital Square (NRT85), and St Mary Graces (MIN86) presented with a greater number of skull fractures than other sites, whereas, St Mary Spital (SRP98) presented with a lower number. Once again, the lower prevalence in the St Mary Spital (SRP98) collection may be due to the younger age-at-death profile. It should be noted that

when St Mary Spital (SRP98) was excluded there were no significant differences between the collections. Conversely, in terms of true prevalence, St Mary Spital (SRP98) presented with a greater number of fractures compared to other sites, while Blackfriars (PIC87) presented with less (Fisher's Exact Test, $p = 0.01$, $\Phi_c = 0.02$). It was, however, a rather weak relationship.

Table 7.11: Crude Prevalence of violence-related skull trauma

COLLECTION	N	AFFECTED	%
St Nicholas Shambles (GPO75)	99	12	12.1
St Lawrence Jewry (GYE92)	44	3	6.8
Spital Square (NRT95)	40	4	10.0
St Mary Spital (SRP98)	4442	161	3.6%
London Blackfriars (PIC87)	36	2	5.6
St Mary Graces (MIN86)	208	26	12.5
St Benet Sherehog (ONE94)	13	1	7.7
TOTAL	**4882**	**209**	**4.3%**

Table 7.12: True Prevalence of violent-related skull trauma

COLLECTION	BONE COUNT	# OF FRACTURES	%
St Nicholas Shambles (GPO75)	3478	14	0.4%
St Lawrence Jewry (GYE92)	1724	3	0.2%
Spital Square (NRT95)	1849	4	0.2%
St Mary Spital (SRP98)	33797	188	0.6%
London Blackfriars (PIC87)	1579	2	0.1%
St Mary Graces (MIN86)	8630	35	0.4%
St Benet Sherehog (ONE94)	341	2	0.6%
TOTAL	**51398**	**248**	**0.5%**

Blunt force trauma to the cranial vault represented the largest percentage of skull fractures with a crude prevalence of 1.5% (75/4882; Table 7.13). More individuals were affected by blunt force trauma to the cranial vault than any other type of skull trauma, a difference that was statistically significant but with a very weak relationship ($\chi^2 = 68.465$, $df = 4$, $p < 0.001$, $\Phi_c = 0.05$). There was also a greater prevalence of dental trauma compared to other forms of trauma, while there was a smaller amount of sharp force and puncture trauma (Table 7.13; Table 7.14). The results remained of similar significance when St Mary Spital (SRP98) was omitted.

Table 7.13: Crude Prevalence of Cranial Vault Fractures by Type

COLLECTION	N	SHARP FORCE		BLUNT FORCE		PUNCTURE	
		AFF	%	AFF	%	AFF	%
St Nicholas Shambles (GPO75)	99	2	2.0%	4	4.0%	2	2.0%
St Lawrence Jewry (GYE92)	44	2	4.5%	1	2.3%	0	0.0%
Spital Square (NRT85)	40	0	0.0%	2	5.0%	0	0.0%
St Mary Spital (SRP98)	4442	27	0.6%	56	1.3%	2	0.1%
London Blackfriars (PIC87)	36	0	0.0%	2	5.6%	0	0.0%
St Mary Graces (MIN86)	208	3	1.4%	9	4.3%	2	1.0%
St Benet Sherehog (ONE94)	13	0	0.0%	1	7.7%	0	0.0%
TOTAL	**4882**	**34**	**0.7%**	**75**	**1.5%**	**6**	**0.1%**

Table 7.14: Crude Prevalence of Facial and Dental Fractures

COLLECTION	FACIAL			DENTAL		
	N	AFF	%	N	AFF	%
St Nicholas Shambles (GPO75)	62	0	0.0%	62	5	8.1%
St Lawrence Jewry (GYE92)	33	0	0.0%	32	0	0.0%
Spital Square (NRT85)	35	2	5.7%	35	0	0.0%
St Mary Spital (SRP98)	4080	30	0.7%	4080	46	1.1%
London Blackfriars (PIC87)	30	0	0.0%	32	0	0.0%
St Mary Graces (MIN86)	175	7	4.0%	175	10	5.7%
St Benet Sherehog (ONE94)	8	1	12.5%	9	0	0.0%
TOTAL	**4576**	**40**	**0.9%**	**4576**	**57**	**1.2%**

The parietal was the cranial vault bone most affected by all types of trauma, with a true prevalence of 1.0%. The left parietal was slightly more affected than the right one, although not to a statistically significant extent. The frontal bone was the next most affected location with a true prevalence of 0.6%. Both sides of the frontal bone were approximately equally affected. The supraoccipital and temporal bones were rarely affected with true prevalence of 0.4% and 0.1% respectively. Figure 7.3 shows the fracture distribution by cranial vault bone.

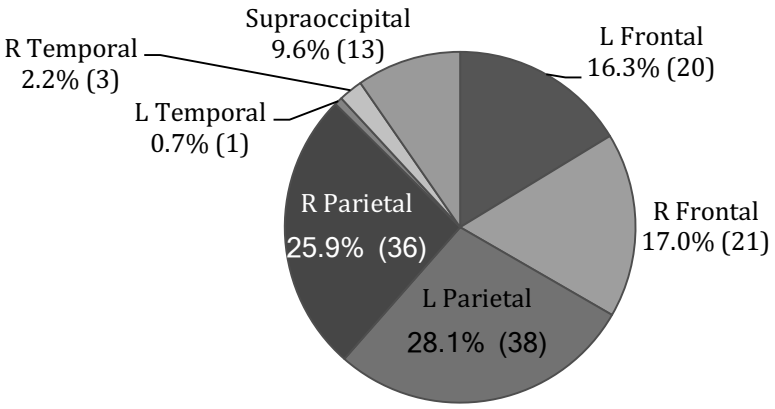


Figure 7.3: Cranial Vault Fracture Distribution

7.2.1 SEX DIFFERENCES

There was a statistically significant difference between males, females, and subadults presenting with skull fractures ($\chi^2 = 53.655$, df = 2, $p < 0.001$, $\Phi_c = 0.11$), with males presenting with more skull fractures and females and subadults presenting with less. There was also a significant difference between the males from each collection (Fisher's Exact Test: $p < 0.001$, $\Phi_c = 0.14$). Males from St Nicholas Shambles (GPO75) and St Mary Graces (MIN86) presented with a greater number of skull fractures relative to other collections and St Mary Spital (SPR98) males presented with less. Once again, the low prevalence in St Mary Spital (SRP98) may be due to the younger age-at-death profile. In terms of females presenting with skull fractures, there was also a statistically significant difference (Fisher's Exact Test: $p < 0.001$, $\Phi_c = 0.16$). Females from St Mary Graces (MIN86) and St Benet Sherehog (ONE94) presented with a greater number of skull fractures than other sites, whereas St Mary Spital (SRP98) females presented with less (see above for reasoning). The difference between the subadults approached significance with Spital Square (NRT85) presenting with more fractures and St Mary Spital (SRP98) presenting with less (Fisher's Exact Test: $p = 0.65$, $\Phi_c = 0.10$). Within each collection there was no significant difference between males and females, except for in St Mary Spital (SRP98; $\chi^2 = 11.152$, df = 1, $p < 0.001$, $\Phi_c = 0.06$). See Table 7.15 for the full distribution.

Table 7.15: Crude Prevalence of Skull Fractures by Sex

COLLECTION	MALES			FEMALES			SUBADULTS		
	N	AFF	%	N	AFF	%	N	AFF	%
St Nicholas Shambles (GPO75)	29	6	20.7%	26	1	3.8%	31	1	3.2%
St Lawrence Jewry (GYE92)	11	2	18.2%	13	1	7.7%	13	0	0.0%
Spital Square (NRT85)	18	2	11.1%	6	1	16.7%	13	1	7.7%
St Mary Spital (SRP98)	1784	100	5.6%	1580	50	3.1%	907	7	0.8%
London Blackfriars (PIC87)	14	1	7.1%	9	1	11.1%	8	0	0.0%
St Mary Graces (MIN86)	97	18	18.6%	42	5	11.9%	61	2	3.3%
St Benet Sherehog (ONE94)	5	0	0.0%	1	1	100.0%	3	0	0.0%
TOTAL	**1958**	**129**	**6.6%**	**1677**	**60**	**3.6%**	**1036**	**11**	**1.1%**

In terms of the type of skull trauma present, there was a statistically significant difference between males, females, and subadults (blunt force trauma: χ^2 = 17.67, df = 2, p < 0.001, Φ_c = 0.06; sharp force trauma: χ^2 = 18.177, df = 2, p < 0.001, Φ_c = 0.06; facial trauma: χ^2 = 11.832, df = 2, p = 0.003, Φ_c = 0.05; dental trauma: χ^2 = 9.2061, df = 2, p = 0.01, Φ_c = 0.05; Figure 7.4), except regarding puncture trauma. Males presented with a greater number of fractures for all types of skull trauma. Females only presented with a significant number of blunt force fractures to the cranial vault, the number of which was lower than expected. Subadults were rarely affected by skull trauma with only 1.3% (16/1237) of individuals affected. Of those 16 subadults, ten were affected by blunt force trauma to the cranial vault. For all types of skull trauma, subadults presented with a lesser number of fractures compared to adults.

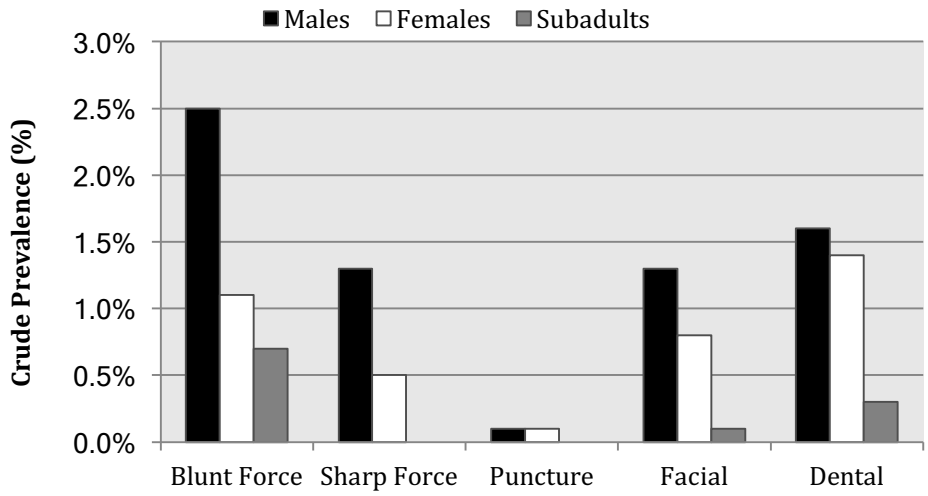


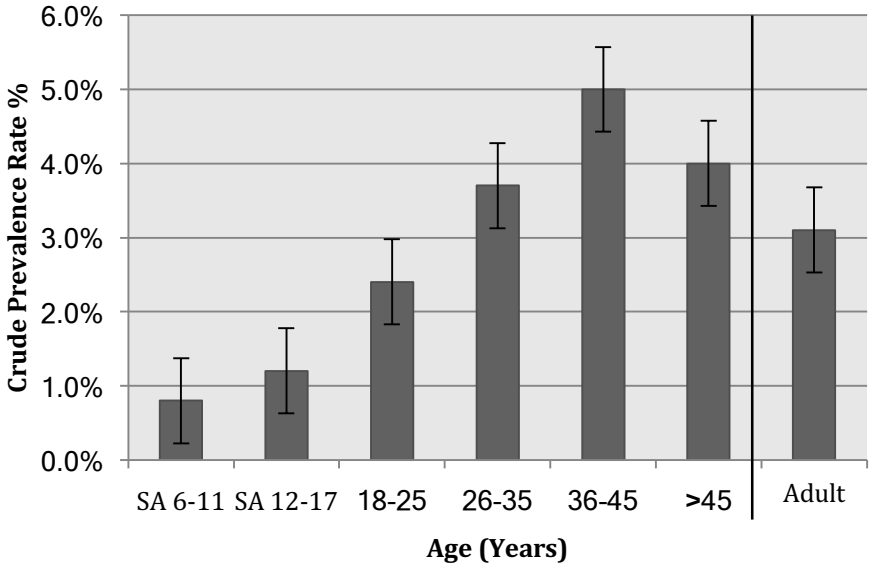
Figure 7.4: Crude Prevalence of Skull Fracture by Trauma Type and Sex

7.2.2 AGE DIFFERENCES

Skull fractures did present with an age distribution indicative of accumulation with increased age, excepting for the oldest age group. There was a statistically

significant difference between the age groups, but the relationship was weak (χ^2 = 33.574, df = 5, p < 0.001, Φ_c = 0.08; Figure 7.5). There was a smaller number of skull fractures in the oldest age group (>45) than the individuals aged 36-45, but the difference was not significant and was within the standard of error. The two subadult age groups that presented with skull fractures had a lower number. The 36-45 age group presented with a greater number of skull fractures relative to the other age groups.

Figure 7.5: Crude Prevalence of Skull Fracture by Age Group



7.2.3 DIFFERENCES IN CEMETERY TYPE

Excluding St Mary Spital (SRP98) and Spital Square (NRT85), there was no statistically significant difference between the lay sites and monastic sites regarding overall skull fractures (Table 7.16). However, the difference between males in the lay sites and males in the monastic sites was significant (χ^2 = 4.1577, df = 1, p = 0.04, Φ_c = 0.16; Table 7.17). There were no significant differences between the females from the lay sites and the females from the monastic sites. The same was true of subadults. Similar to the pattern seen with the total

number of fractures, there was no statistically significant differences between the sexes from the monastic sites, but the difference between the males and females from the lay sites approached significance ($\chi^2 = 3.5462$, df = 1, p = 0.06, $\Phi_c = 0.15$). The two categories had similar age-at-death profiles so demography does not appear to be a complication.

Table 7.16: Crude Prevalence of Skull Fracture by Cemetery Type

CATEGORY	N	AFF	%
Monastic	125	10	8.0%
Lay	275	34	12.4%
TOTAL	**400**	**44**	**11.0%**

Table 7:17: Crude Prevalence of Skull Fracture by Cemetery Type and Sex

CATEGORY	MALES			FEMALES			SUBADULTS		
	N	AFF	%	N	AFF	%	N	AFF	%
Monastic	65	6	9.2%	23	2	8.7%	26	1	3.8%
Lay	91	21	23.1%	68	7	10.3%	90	2	2.2%
TOTAL	**156**	**27**	**17.3%**	**91**	**9**	**9.9%**	**116**	**3**	**2.6%**

7.2.4 BLUNT FORCE TRAUMA

The crude prevalence of blunt force trauma to the cranial vault was 1.5% (75/4882; Table 7.13) and there was a statistically significant difference between the collections (Fisher's Exact Test: $p < 0.001$, $\Phi_c = 0.08$). St Benet Sherehog (ONE84) had the highest crude prevalence of cranial blunt force trauma with 7.7% (1/13) of individuals affected, but it did not significantly differ from other sites. St Nicholas Shambles (GPO75) and St Mary Graces (MIN86) each presented with a greater number of blunt force injuries relative to other sites. As may be expected from the overall numbers of skull trauma, St Mary Spital (SRP98) had the smallest percentage of blunt force cranial trauma which was significantly less relative to the other collections. Once again it may be due to its younger age-at-death profile. For a full distribution see Table 7.13.

More males presented with blunt force trauma to the cranial vault than females and subadults, although the relationship was very weak ($\chi^2 = 16.678$, df = 2, $p < 0.001$, $\Phi_c = 0.06$; Table 7.18). There was a statistically significant difference between the males in each collection, with males from St Mary Graces (MIN86) presenting with more blunt force trauma and males from St Mary Spital (SRP98) presenting with less (Fisher's Exact Test: $p = 0.013$, $\Phi_c = 0.09$). Once again this may be due to its younger age-at-death profile. No females were affected by blunt force trauma in three of the collections: St Nicholas Shambles (GPO75), St Lawrence Jewry (GYE92), and Spital Square (NRT85; Table 6.19). Only one female each was affected in Blackfriars (PIC87), St Mary Graces (MIN86), and St Benet Sherehog (ONE94). Subadult fractures were, for the most part, evenly distributed between the collections, and there were no differences between them. In only one collection, St Mary Spital (SRPS98), did males present with a significantly greater number of blunt force injuries than females ($\chi^2 = 8.2506$, df = 1, $p = 0.004$, $\Phi_c = 0.05$). There were no differences between the sexes found in the other collections.

Table 7.18: Crude Prevalence of Blunt Force Cranial Trauma by Sex

COLLECTION	MALES			FEMALES			SUBADULTS		
	N	AFF	%	N	AFF	%	N	AFF	%
St Nicholas Shambles (GPO75)	29	2	6.9%	26	0	0.0%	31	1	3.2%
St Lawrence Jewry (GYE92)	11	1	9.1%	13	0	0.0%	13	0	0.0%
Spital Square (NRT85)	18	0	0.0%	6	0	0.0%	13	1	7.7%
St Mary Spital (SRP98)	1717	37	2.2%	1530	14	0.9%	851	5	0.6%
London Blackfriars (PIC87)	14	1	7.1%	9	1	11.1%	8	0	0.0%
St Mary Graces (MIN86)	97	7	7.2%	42	1	2.4%	61	1	1.6%
St Benet Sherehog (ONE94)	5	0	0.0%	1	1	100.0%	3	0	0.0%
TOTAL	**1958**	**48**	**2.5%**	**1677**	**17**	**1.0%**	**980**	**8**	**0.8%**

There was a statistically significant difference in terms of the location of blunt force trauma on the cranial vault ($\chi^2 = 32.363$, df = 6, $p < 0.001$, $\Phi_c = 0.04$).

However, the relationship was very weak. The right parietal was the most affected bone in the cranial vault with a true prevalence of 0.7% (Table 7.19). Both the right and left parietal presented with a greater number of cranial blunt force trauma compared to other cranial bones. The temporal bones had the lowest true prevalence and were significantly less affected by blunt force trauma than expected.

Table 7.19: True Prevalence of Cranial Vault Blunt Force Trauma

CRANIAL BONE	BONE COUNT	AFF	%
L Frontal	3341	13	0.4%
R Frontal	3306	14	0.4%
L Parietal	3562	22	0.6%
R Parietal	3562	19	0.5%
L Temporal	3213	1	0.0%
R Temporal	3201	2	0.1%
Supraoccipital	3539	7	0.2%

The cranial vault fracture distribution was similar between males, females, and subadults with the parietal bones being the most affected, followed by the frontal bone (Table 7.20). Males presented with fewer blunt force injuries to the left and right temporal than expected ($\chi^2 = 18.631$, df = 6, p = 0.004, $\Phi_c = 0.04$). Females also presented with a significant difference in the location of blunt force trauma (Fisher's Exact Test: p = 0.05, $\Phi_c = 0.04$), with a greater number of fractures to the right and left parietals than would be expected. There were no statistically significant differences in terms of the location of blunt force trauma amongst the subadults.

Table 7.20: True Prevalence of Cranial Vault Blunt Force Trauma by Sex

BONE	MALES			FEMALES			SUBADULTS		
	N	AFF	%	N	AFF	%	N	AFF	%
L Frontal	1358	10	0.7%	1161	2	0.2%	694	1	0.1%
R Frontal	1316	11	0.8%	1160	2	0.2%	690	1	0.1%
L Parietal	1429	12	0.8%	1197	6	0.5%	772	3	0.4%
R Parietal	1436	10	0.7%	1207	6	0.5%	760	2	0.3%
L Temporal	1330	1	0.1%	1107	0	0.0%	650	0	0.0%
R Temporal	1337	1	0.1%	1116	1	0.1%	632	0	0.0%
Supraoccipital	1456	5	0.3%	1212	1	0.1%	719	1	0.1%

Figure 7.6 shows the full distribution of blunt force trauma across the cranium. The St Mary Spital (SRP98) injuries are excluded, as they were unable to be physically examined by the author and the exact location of injuries is unknown. While statistically, no patterns were apparent, we can see that there is a slight preponderance of injuries on the left parietal and the left side of the right parietal, with many of the injuries concentrating on the posterior end of the cranium. Excepting for two lesions (both of which occurred on the same individual: GPO75, 5201), all of the blunt force injuries were fully healed. In terms of size, the depression fractures varied in size from 30x30mm to 5x5mm, with an average of 16mm ± 7.5mm.

6.2.5 SHARP FORCE TRAUMA

The crude prevalence of sharp force trauma to the cranial vault was 0.6% (34/5860). There was a significant difference between the collections with St Lawrence Jewry (GYE92) presenting with a greater prevalence of sharp force trauma relative to other sites, and St Mary Spital (SRP98) presenting with less (Fisher's Exact Test: $p = 0.05$, $\Phi_c = 0.05$), but the relationship was very weak. In three of the collections no individuals were affected by sharp force trauma: Spital Square (NRT85), Blackfriars (PIC87), and St Benet Sherehog (ONE94). Table 7.13 shows the full distribution of sharp force trauma to the cranial vault.

More males presented with sharp force trauma to the cranial vault than females or subadults. The difference was statistically significant, but the relationship was very weak ($\chi^2 = 15.81$, $df = 2$, $p < 0.001$, $\Phi_c = 0.06$; Table 7.21). The difference between males from each collection was significant (Fisher's Exact Test: $p = 0.04$,

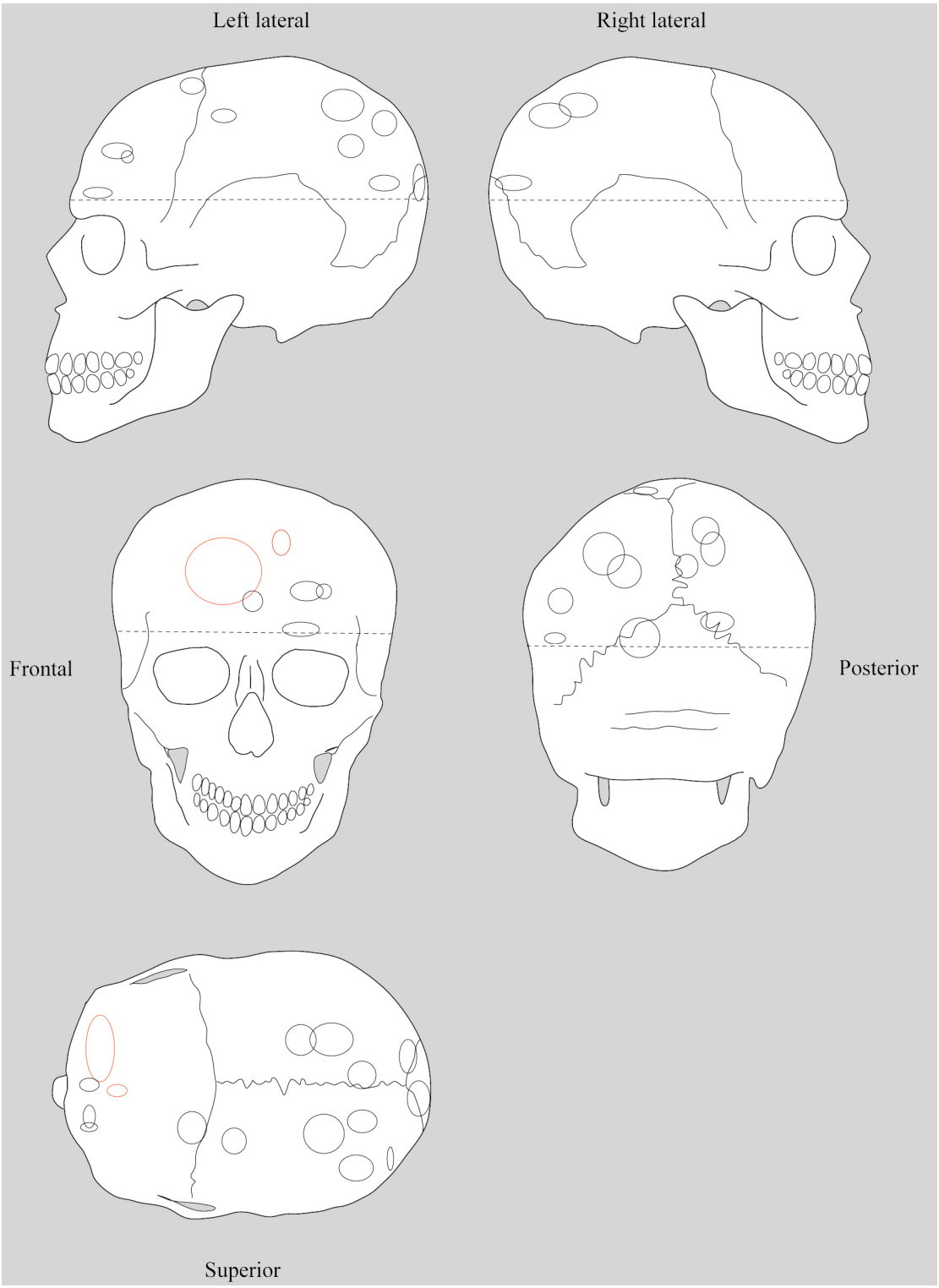


Figure 7.6: Approximate size and location of all blunt force lesions that are possibly indicative of violence. The dotted line highlights the approximate position of the hat-brim line. The red circles indicate perimortem trauma, while the black circles indicate antemortem.

$\Phi_c = 0.09$), with males from St Nicholas Shambles (GPO75) and St Lawrence Jewry (GYE92) presenting with more sharp force injuries relative to other sites and St Mary Spital (SRP98) presenting with less, which may be due to its younger age-at-death profile. St Mary Spital (SRP98) and St Lawrence Jewry (GYE92) were the only collections with females exhibiting sharp force trauma. There were no significant differences between them. In the individual collections, males and females did not differ significantly. Overall, only one subadult, from the St Mary Spital (SRP98) collection, was affected by sharp force trauma to the cranial vault, representing 0.1% of all subadults.

Table 7.21: Crude Prevalence of Cranial Vault Sharp Force Trauma by Sex

COLLECTION	MALES			FEMALES			SUBADULTS		
	N	AFF	%	N	AFF	%	N	AFF	%
St Nicholas Shambles (GPO75)	29	2	6.9%	26	0	0.0%	31	0	0.0%
St Lawrence Jewry (GYE92)	11	1	9.1%	13	1	7.7%	13	0	0.0%
Spital Square (NRT85)	18	0	0.0%	6	0	0.0%	13	0	0.0%
St Mary Spital (SRP98)	1717	20	1.2%	1530	7	0.5%	851	1	0.1%
London Blackfriars (PIC87)	14	0	0.0%	9	0	0.0%	8	0	0.0%
St Mary Graces (MIN86)	97	3	3.1%	42	0	0.0%	61	0	0.0%
St Benet Sherehog (ONE94)	5	0	0.0%	1	0	0.0%	3	0	0.0%
TOTAL	**1958**	**26**	**1.3%**	**1677**	**8**	**0.5%**	**980**	**1**	**0.1%**

There was a statistically significant difference in the location of sharp force injuries on the cranial vault, but the relationship was very weak (Fisher's Exact Test: $p < 0.001$, $\Phi_c = 0.04$). As with blunt force trauma, the parietals were the cranial bones most affected by blunt force trauma, with a true prevalence of 0.4% for both the left and right parietal (Table 7.22), which was significantly higher compared to other cranial bones. The frontal bone was the next most affected bone, although it did not significantly differ from expected. The supraoccipital and both temporal bones presented with less sharp force injuries compared with the rest of the cranial bones.

Table 7.22: True Prevalence of Cranial Vault Sharp Force Trauma

CRANIAL BONE	BONE COUNT	AFF	%
L Frontal	3341	6	0.2%
R Frontal	3306	5	0.2%
L Parietal	3562	14	0.4%
R Parietal	3562	9	0.3%
L Temporal	3213	0	0.0%
R Temporal	3201	0	0.0%
Supraoccipital	3539	0	0.0%

Males and females had a similar distribution of sharp force trauma across the cranial vault with the parietals more affected than the other bones for both sexes. Males presented with significantly more sharp force trauma injuries to both parietals and less to the left temporal (Fisher's Exact Test: $p < 0.001$, $\Phi_c = 0.05$; Table 7.23). There was no significant difference between the locations of sharp force injuries to the cranial vault in females. The one subadult affected presented with sharp force trauma to the left parietal.

Table 7.23: True Prevalence of Cranial Vault Sharp Force Trauma by Sex

CRANIAL BONE	MALES			FEMALES			SUBADULTS		
	N	AFF	%	N	AFF	%	N	AFF	%
L Frontal	1358	4	0.3%	1161	2	0.2%	694	0	0.0%
R Frontal	1316	4	0.3%	1160	1	0.1%	690	0	0.0%
L Parietal	1429	9	0.6%	1197	2	0.2%	772	1	0.1%
R Parietal	1436	7	0.5%	1207	3	0.2%	760	0	0.0%
L Temporal	1330	0	0.0%	1107	0	0.0%	650	0	0.0%
R Temporal	1337	0	0.0%	1116	0	0.0%	632	0	0.0%
Supraoccipital	1456	0	0.0%	1212	0	0.0%	719	0	0.0%

Figure 7.7 shows the full distribution of sharp force trauma across the cranial vault. As above, the St Mary Spital (SRP98) data is omitted since it was not able to be physically examined and the exact location of injuries is unknown. While there was not a large amount of sharp force trauma in the collections, most of the trauma that was present affected the top of the cranial vault, across the sagittal suture. While directionality is uncertain due to the position of the head at the time of the incident, if it is assumed that the head was facing front at the time, three of the injuries are likely to have been caused by a frontal assault, two from

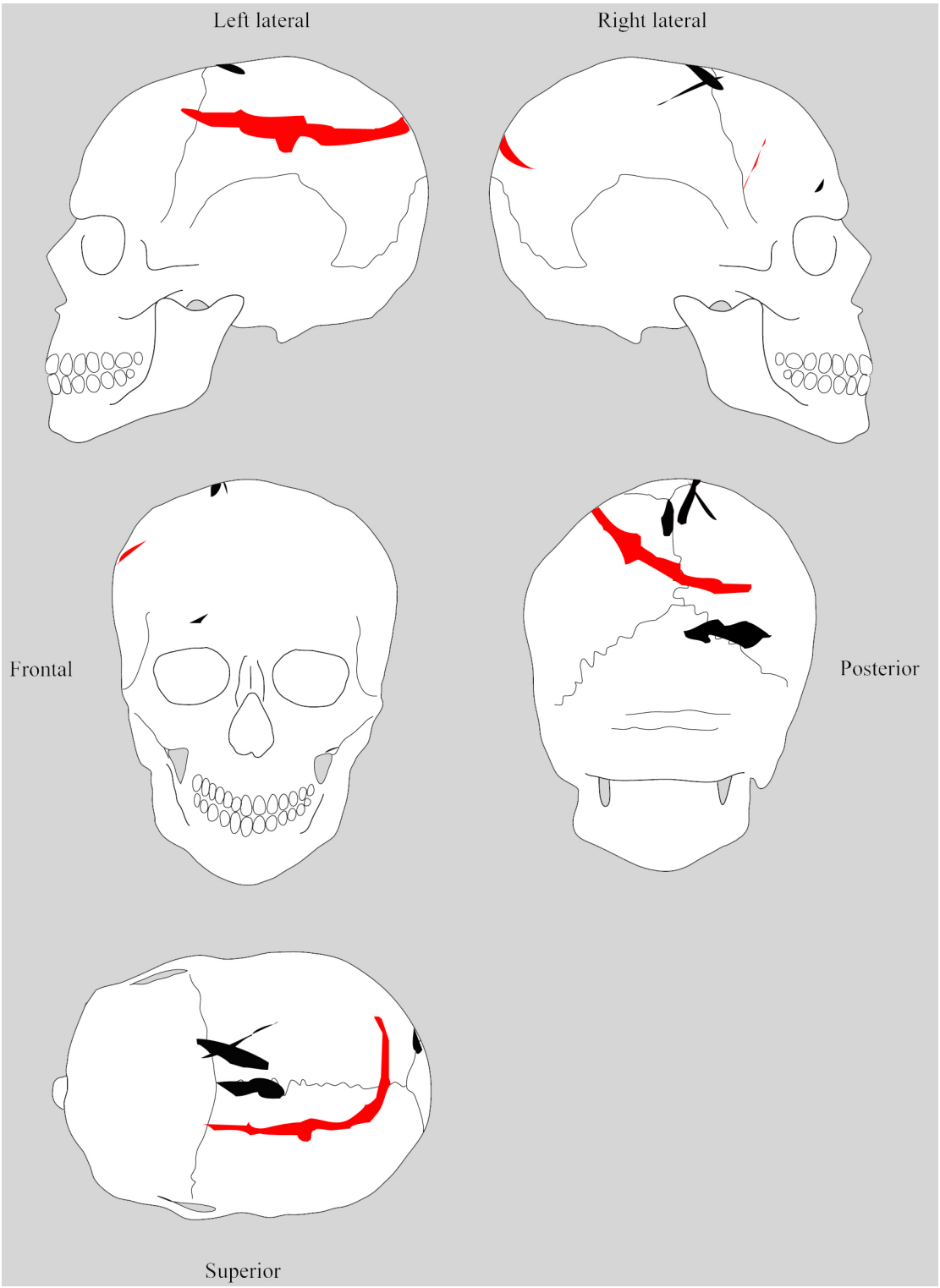


Figure 7.7: Approximate size and location of all sharp force lesions that are possibly indicative of violence. The red indicates perimortem trauma, while the black indicates antemortem.

a rear assault, and one from the side. Two of the injuries were perimortem, two were in the process of healing, and the rest were antemortem. The types of weapons implicated in these injuries varied (see previous chapter), but swords (~4), axes (~2), and knives/daggers (~1) are the most likely to have been used.

6.2.6 PUNCTURE TRAUMA

Six individuals presented with puncture trauma, representing 0.1% (6/4882) of the population (Table 7.13). Only individuals from St Nicholas Shambles (GPO75), St Mary Graces (MIN86), and St Mary Spital (SRP98) were affected. Both St Nicholas Shambles (GPO75) and St Mary Graces (MIN86) presented with a greater amount of puncture trauma relative to other sites, while St Mary Spital (SRP98) presented with less (Fisher's Exact Test: $p < 0.001$, $\Phi_c = 0.12$). Once again this is likely due to its younger age-at-death profile. Both individuals with puncture trauma from the St Nicholas Shambles (GPO75) and the St Mary Spital (SRP98) collections were male, while in the St Mary Graces (MIN86) collection: one male and one female were affected. No subadults were affected. As the numbers are so small, no significant differences were discerned.

Table 7.24: Crude Prevalence of Puncture Trauma by Sex

COLLECTION	MALES			FEMALES		
	N	AFF	%	N	AFF	%
St Nicholas Shambles (GPO75)	29	2	6.9%	26	0	0.0%
St Lawrence Jewry (GYE92)	11	0	0.0%	13	0	0.0%
Spital Square (NRT85)	18	0	0.0%	6	0	0.0%
St Mary Spital (SRP98)	1717	2	0.1%	1530	0	0.0%
London Blackfriars (PIC87)	14	0	0.0%	9	0	0.0%
St Mary Graces (MIN86)	97	1	1.0%	42	1	2.4%
St Benet Sherehog (ONE94)	5	0	0.0%	1	0	0.0%
TOTAL	**1958**	**5**	**0.3%**	**1677**	**1**	**0.1%**

Omitting the puncture trauma from St Mary Spital (SRP98) since the location is uncertain, two of the puncture lesions affected the left parietal, while one affected the right parietal and the last affected the left side of the occipital (Table 7.25). The one female with puncture trauma was the one located on the occipital. The numbers were too small to determine any statistically significant differences regarding location.

Table 7.25: True Prevalence of Puncture Trauma by Location

CRANIAL BONE	BONE COUNT	AFF	%
L Frontal	3341	0	0.00%
R Frontal	3306	0	0.00%
L Parietal	3562	2	0.06%
R Parietal	3562	1	0.03%
L Temporal	3213	0	0.00%
R Temporal	3201	0	0.00%
Supraoccipital	3539	1	0.03%

Figure 7.8 shows the distribution of puncture trauma across the cranial vault, once again with St Mary Spital (SRP98) omitted. All but two of the lesions (both observed on the female from St Mary Graces) were perimortem. If a frontal position of the head is assumed, two of the injuries are likely to have come from a rear assault and the directionality of the third is uncertain. It is also uncertain what the exact weapons implicated in these injuries were. But, as hypothesised in the previous chapter either bodkin arrowheads or rondel daggers are the most likely choices for all traumas.

7.2.7 FACIAL TRAUMA

The crude prevalence of fractures to the facial bones was 0.9% (40/4576; Table 7.14) and there was a statistically significant difference between the collections (Fisher's Exact Test: $p < 0.001$, $\Phi_c = 0.1$). St Benet Sherehog (ONE94) had the

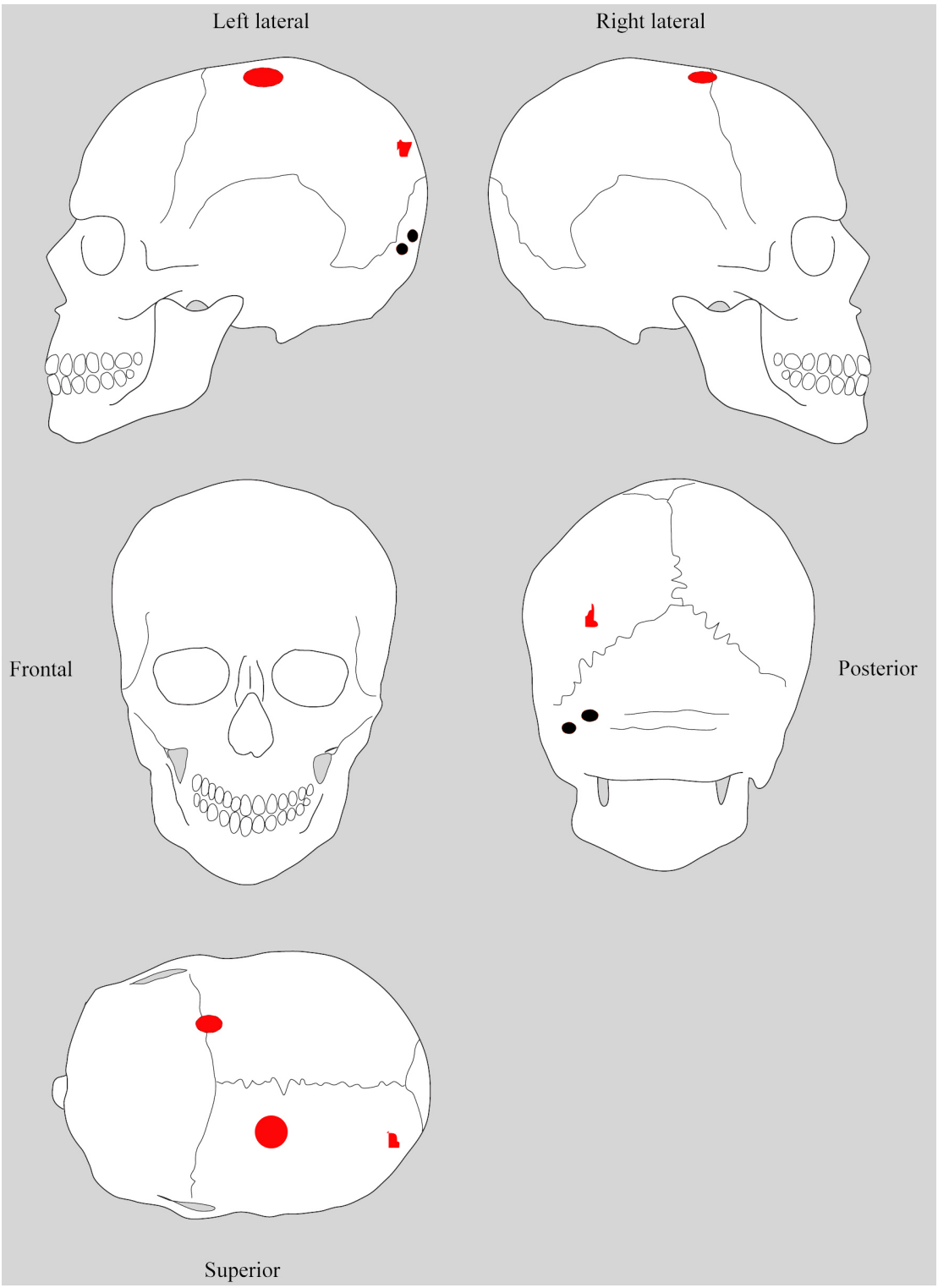


Figure 7.8: Approximate size and location of all puncture lesions that are possibly indicative of violence. The red indicates perimortem trauma, while the black indicates antemortem.

highest crude prevalence of facial trauma, which was significantly greater compared to other sites. Spital Square (NRT85) and St Mary Graces (MIN86) all presented with a greater number of facial fractures relative to other sites. As with all other types of trauma, St Mary Spital (SRP98) had the smallest crude prevalence of individuals with facial trauma, most likely because of its younger age-at-death profile. A total of 0.6% (33/5400) of individuals were affected, which was significantly lower than other sites. There were three collections in which no individuals presented with facial trauma: St Nicholas Shambles (GPO75), St Lawrence Jewry (GYE92), and Blackfriars (PIC87).

More males presented with facial trauma than subadults, but not females (χ^2 = 11.832, df = 2, p = 0.003, Φ_c = 0.05; Table 7.26). However, the relationship was weak. In the individual collections, males and females also did not differ significantly. Males from St Mary Graces (MIN86) presented with a larger percentage of facial fractures relative to other sites, and males from St Mary Spital (SRP98) presented with less (Fisher's Exact Test: p = 0.05, Φ_c = 0.09). Once again this is likely due to its younger age-at-death profile. In terms of the female population, St Mary Spital (SRP98) presented with a significantly lower percentage of facial fractures relative to other sites, while the females from Spital Square (NRT85), St Mary Graces (MIN86), and St Benet Sherehog (ONE94) presented with more (Fisher's Exact Test: p < 0.001, Φ_c = 0.31). Only one subadult, from St Mary Spital (SRP98) presented with facial trauma, for a crude prevalence of 0.1% (1/941).

Table 7.26: Crude Prevalence of Facial Trauma by Sex

COLLECTION	MALES			FEMALES			SUBADULTS		
	N	AFF	%	N	AFF	%	N	AFF	%
St Nicholas Shambles (GPO75)	23	0	0.0%	24	0	0.0%	15	0	0.0%
St Lawrence Jewry (GYE92)	11	0	0.0%	11	0	0.0%	11	0	0.0%
Spital Square (NRT85)	17	1	5.9%	6	1	16.7%	12	0	0.0%
St Mary Spital (SRP98)	1707	20	1.2%	1522	9	0.6%	851	1	0.1%
London Blackfriars (PIC87)	12	0	0.0%	9	0	0.0%	9	0	0.0%
St Mary Graces (MIN86)	91	5	5.5%	42	2	4.8%	42	0	0.0%
St Benet Sherehog (ONE94)	6	0	0.0%	1	1	100.0%	1	0	0.0%
TOTAL	**1867**	**26**	**1.4%**	**1615**	**13**	**0.8%**	**941**	**1**	**0.1%**

In terms of facial fracture location, there was a significant difference in true prevalence (Fisher's Exact Test: $p < 0.001$, $\Phi_c = 0.08$). However, the relationship was very weak. The nasal bones were the most affected by facial trauma with a true prevalence of 1.4% (20/1414) for the left nasal and 1.3% (19/1441) for the right nasal (Table 7.27). Both nasal bones presented with greater number of fractures relative to the other facial elements. The other facial bones were about equally affected. However, the maxillae, the right mandible, and right zygomatic all presented a lower number of fractures than expected.

Table 7.27: True Prevalence of Facial Trauma by Location

FACIAL BONE	BONE COUNT	AFF	%
L Mandible	3531	5	0.1%
R Mandible	3468	4	0.1%
L Maxilla	3047	3	0.1%
R Maxilla	3038	2	0.1%
L Nasal	1414	20	1.4%
R Nasal	1441	19	1.3%
L Zygomatic	2684	3	0.1%
R Zygomatic	2796	2	0.1%

When separated into sexes, there was a significant difference in facial fracture location amongst the males (Fisher's Exact Test: $p < 0.001$, $\Phi_c = 0.1$). Both nasal bones presented with a larger number of fractures relative to other facial bones, and the right zygomatic presented with less. The same was true of females, although the relationship was weaker (Fisher's Exact Test: $p < 0.001$, $\Phi_c = 0.07$). The fracture distribution across the facial bones was similar between

males and females (Table 7.28). Regarding the one subadult affected by facial trauma, the individual from St Mary Spital (SRP98), presented with a fractured left and right nasal.

Table 7.28: True Prevalence of Facial Trauma by Sex

FACIAL BONE	MALES			FEMALES			SUBADULTS		
	N	AFF	%	N	AFF	%	N	AFF	%
L Mandible	1429	4	0.3%	1197	1	0.1%	765	0	0.0%
R Mandible	1377	2	0.1%	1187	2	0.2%	743	0	0.0%
L Maxilla	1243	2	0.2%	1040	1	0.1%	633	0	0.0%
R Maxilla	1226	2	0.2%	1070	0	0.0%	634	0	0.0%
L Nasal	655	14	2.1%	548	5	0.9%	168	1	0.6%
R Nasal	664	13	2.0%	555	5	0.9%	176	1	0.6%
L Zygomatic	1123	3	0.3%	924	0	0.0%	529	0	0.0%
R Zygomatic	1179	1	0.1%	956	1	0.1%	544	0	0.0%

7.2.8 DENTAL FRACTURES

The crude prevalence of dental fractures was 1.2% (57/4576; Table 7.14). Only three collections presented with dental fractures: St Nicholas Shambles (GPO75), St Mary Spital (SRP98), and St Mary Graces (MIN86). There was a statistically significant difference between the collections with St Nicholas Shambles (GPO75) and St Mary Graces (MIN86) presenting with a greater number of dental fractures relative to other sites (Fisher's Exact Test: $p < 0.001$, $\Phi_c = 0.1$). St Mary Spital (SRP98) presented with less, most likely because of its younger age-at-death profile.

Males presented with the greatest percentage of dental fractures, which was significantly greater than subadults but not females ($\chi^2 = 9.22$, df = 2, $p = 0.01$, $\Phi_c = 0.05$; Table 7.29). The relationship, however, was very weak. Males from the St Mary Graces (MIN86) collection presented with the greatest prevalence of dental fractures with 7.7% affected. This percentage was significantly higher than expected, while the 1.3% of males affected from the St Mary Spital (SRP98)

collection was significantly lower than the other sites because of its younger age-at-death profile (Fisher's Exact Test: $p = 0.01$, $\Phi_c = 0.11$). There were no significant differences between the females from each collection. Only three subadults presented with dental fractures: two from the St Mary Spital (SRP98) collection and one from the St Mary Graces (MIN86) collection.

Table 7.29: Crude Prevalence of Dental Fractures by Sex

COLLECTION	MALES			FEMALES			SUBADULTS		
	N	AFF	%	N	AFF	%	N	AFF	%
St Nicholas Shambles (GPO75)	23	1	4.3%	24	1	4.2%	15	0	0.0%
St Lawrence Jewry (GYE92)	11	0	0.0%	11	0	0.0%	10	0	0.0%
Spital Square (NRT85)	18	0	0.0%	6	0	0.0%	11	0	0.0%
St Mary Spital (SRP98)	1707	23	1.3%	1522	21	1.4%	851	2	0.2%
London Blackfriars (PIC87)	14	0	0.0%	9	0	0.0%	9	0	0.0%
St Mary Graces (MIN86)	91	7	7.7%	42	1	2.4%	42	1	2.4%
St Benet Sherehog (ONE94)	5	0	0.0%	1	0	0.0%	3	0	0.0%
TOTAL	**1869**	**31**	**1.7%**	**1615**	**23**	**1.4%**	**941**	**3**	**0.3%**

7.3 RIB FRACTURES

In total, 4.7% (277/5934) of individuals presented with at least one rib fracture (Table 7.30). In terms of crude prevalence, there were no significant differences between the collections. It is interesting to note that this is the first specific type of trauma were the individuals from St Mary Spital (SRP98) did not present with significantly less injuries than the rest of the collections, which means that they may have been even more prone to rib fractures as they did not have as much time to accumulate fractures due to their younger age-at-death profile. Blackfriars (PIC87) was the only site that did not present with any rib fractures.

Table 7.30: Crude Prevalence of Rib Fracture by Skeletal Collection

COLLECTION	N	AFF	%
St Nicholas Shambles (GPO75)	135	5	3.7%
St Lawrence Jewry (GYE92)	46	2	4.3%
Spital Square (NRT95)	38	2	5.3%
St Mary Spital (SRP98)	5400	257	4.8%
London Blackfriars (PIC87)	42	0	0.0%
St Mary Graces (MIN86)	255	10	3.9%
St Benet Sherehog (ONE94)	18	1	5.5%
TOTAL	**5934**	**277**	**4.7%**

7.3.1 SEX DIFFERENCES

Males presented with significantly more rib fractures than females and subadults, whereas subadults presented with less, a difference that was statistically significant ($\chi^2 = 90.128$, df = 2, $p < 0.001$, $\Phi_c = 0.13$; Table 7.31). This relationship between the sexes is further exacerbated by the fact that males had a younger age-at-death profile than females, and hence had a shorter amount of time to accumulate fractures. There were no statistically significant differences between the males presenting with rib fractures from different collections. The same was true of the females. The only subadults with rib fractures were found in the St Mary Spital (SRP98) collection.

Table 7.31: Crude Prevalence of Rib Fractures by Sex

COLLECTION	MALES			FEMALES			SUBADULTS		
	N	AFF	%	N	AFF	%	N	AFF	%
St Nicholas Shambles (GPO75)	38	1	2.6%	37	2	5.4%	41	0	0.0%
St Lawrence Jewry (GYE92)	12	2	16.7%	17	0	0.0%	15	0	0.0%
Spital Square (NRT85)	17	1	5.9%	7	1	14.3%	12	0	0.0%
St Mary Spital (SRP98)	2238	164	7.3%	1889	80	4.2%	1033	4	0.4%
London Blackfriars (PIC87)	11	0	0.0%	10	0	0.0%	8	0	0.0%
St Mary Graces (MIN86)	100	10	10.0%	55	0	0.0%	67	0	0.0%
St Benet Sherehog (ONE94)	7	1	14.3%	3	0	0.0%	4	0	0.0%
TOTAL	**2423**	**179**	**7.4%**	**2018**	**83**	**4.1%**	**1180**	**4**	**0.3%**

In terms of true prevalence, males presented with significantly more rib fractures compared to females and subadults ($\chi^2 = 181.58$, df = 2, $p < 0.001$, $\Phi_c = 0.05$; Table 7.32). However, the relationship was very weak. Once again, subadults had a significantly smaller percentage of rib fractures than adults with only subadults from St Mary Spital (SRP98) presenting with rib fractures. But, females also presented with a lower true prevalence of rib fractures than expected. There was no difference between the males or the females within each skeletal collection.

Table 7.32: True Prevalence of Rib Fractures by Sex

COLLECTION	MALES			FEMALES			SUBADULTS		
	N	AFF	%	N	AFF	%	N	AFF	%
St Nicholas Shambles (GPO75)	670	1	0.1%	614	2	0.2%	467	0	0.00%
St Lawrence Jewry (GYE92)	276	3	1.1%	408	0	0.0%	360	0	0.00%
Spital Square (NRT85)	390	1	0.3%	147	1	0.7%	252	0	0.00%
St Mary Spital (SRP98)	35986	322	0.9%	30280	128	0.4%	15717	6	0.04%
London Blackfriars (PIC87)	200	0	0.0%	185	0	0.0%	147	0	0.00%
St Mary Graces (MIN86)	1348	16	1.2%	633	0	0.0%	859	0	0.00%
St Benet Sherehog (ONE94)	156	2	1.3%	36	0	0.0%	60	0	0.00%
TOTAL	**39026**	**345**	**0.9%**	**32303**	**131**	**0.4%**	**17802**	**6**	**0.03%**

6.3.2 DIFFERENCES IN CEMETERY TYPE

Excluding the St Mary Spital sites (SPR98 and NRT85), the monastic cemeteries presented with a greater percentage of rib fractures than the lay ones. However, the difference was not statistically significant (Table 7.33).

Table 7.33: Crude Prevalence of Rib Fracture by Cemetery Type

CATEGORY	N	AFF	%
Monastic	155	7	4.5%
Lay	341	11	3.2%
TOTAL	**496**	**18**	**3.6%**

There was no significant difference between the males and females presenting with rib fractures from the different cemetery types (Table 7.34). There were also no statistically significant differences either between the males from the monastic and lay cemeteries or between the females.

Table 7.34: Crude Prevalence of Rib Fracture by Cemetery Type and by Sex

CATEGORY	MALES			FEMALES		
	N	AFF	%	N	AFF	%
Monastic	64	7	10.9%	31	0	0.0%
Lay	104	7	6.7%	91	2	2.2%
TOTAL	**168**	**14**	**8.3%**	**122**	**2**	**1.6%**

Regarding true prevalence, the difference between males from the monastic and lay cemeteries approached significance, with males from the monastic cemeteries presenting with a greater prevalence of rib fractures ($\chi^2 = 3.6332$, df

= 1, p = 0.06, Φ_c = 0.04). However, the relationship was very weak. There was no difference between the females from either site type.

Table 7.35: True Prevalence of Rib Fracture by Cemetery Type and Sex

CATEGORY	MALES			FEMALES		
	N	AFF	%	N	AFF	%
Monastic	904	12	1.3%	359	0	0.0%
Lay	1818	10	0.6%	1517	2	0.1%
TOTAL	**2722**	**22**	**0.8%**	**1876**	**2**	**0.1%**

7.4 METACARPAL FRACTURES

A total of 2.7% (96/3535) of individuals presented with at least one metacarpal fracture. While there were no statistically significant differences between the collections when St Mary Spital (SRP98) was included, when that collection was omitted the differences became significant (Fisher's Exact Test: p = 0.02, Φ_c = 0.05; Table 7.36). However, the relationship was weak. St Mary Graces (MIN86) presented with a lesser number of metacarpal fractures relative to other sites. Both St Mary Graces (MIN86) and St Lawrence Jewry (GYE92) did not present with any metacarpal fractures.

Table 7.36: Crude Prevalence of Metacarpal Fractures by Collection

COLLECTION	N	AFF	%
St Nicholas Shambles (GPO75)	101	5	5.0%
St Lawrence Jewry (GYE92)	47	0	0.0%
Spital Square (NRT95)	31	1	3.2%
St Mary Spital (SRP98)	3077	88	2.9%
London Blackfriars (PIC87)	42	1	2.4%
St Mary Graces (MIN86)	219	0	0.0%
St Benet Sherehog (ONE94)	18	1	5.6%
TOTAL	**3535**	**96**	**2.7%**

7.4.1 SEX DIFFERENCES

In terms of metacarpal fractures, males presented with a higher percentage of metacarpal fractures than females. However, the difference was not statistically

significant (Table 7.37). Interestingly, when St Mary Spital (SRP98) was omitted, females presented with a higher percentage of metacarpal fractures than males (Table 7.38). But, once again the difference was not significant. No subadults from any collection presented with a metacarpal fracture.

Table 7.37: Crude Prevalence of Metacarpal Fractures by Sex

COLLECTION	MALES			FEMALES		
	N	AFF	%	N	AFF	%
St Nicholas Shambles (GPO75)	34	3	8.8%	38	2	5.3%
St Lawrence Jewry (GYE92)	12	0	0.0%	17	0	0.0%
Spital Square (NRT85)	17	0	5.9%	6	1	16.7%
St Mary Spital (SRP98)	1401	62	4.4%	1063	35	3.3%
London Blackfriars (PIC87)	13	1	7.7%	12	0	0.0%
St Mary Graces (MIN86)	106	0	0.0%	57	0	0.0%
St Benet Sherehog (ONE94)	8	0	0.0%	5	1	20.0%
TOTAL	**1591**	**66**	**4.1%**	**1198**	**39**	**3.3%**

7.4.2 DIFFERENCES IN CEMETERY TYPE

In terms of cemetery type, there were no statistically significant differences between the collections (Table 7.38). There were also no statistically significant differences between the males from different types of cemeteries. The same was true of the females.

Table 7.38: Crude Prevalence of Metacarpal Fractures by Cemetery Type and Sex

CATEGORY	MALES			FEMALES			TOTAL		
	N	AFF	%	N	AFF	%	N	AFF	%
Monastic	72	1	1.4%	79	0	0.0%	155	1	0.6%
Lay	101	3	3.0%	96	4	4.2%	308	6	1.9%
TOTAL	**173**	**4**	**2.3%**	**175**	**4**	**2.3%**	**463**	**7**	**1.5%**

7.5 INJURY RECIDIVISM

A total of 501 individuals from the combined collections, or 8.1%, were affected by two or more fractures. They represented 37.5% of all fractured individuals. There was a total of 1,605 bone fractures between those 501 individuals for an average of 3.2 fractures per person. St Benet Sherehog (ONE94) had the highest

crude prevalence of multiple fractures with 14.3% (3/21) of individuals affected. St Nicholas Shambles (GPO75) and St Mary Graces (MIN85) had a similar crude prevalence with 9.2% (20/218) and 8.9% (32/361) affected respectively. St Lawrence Jewry (GYE92) had the lowest crude prevalence with 3.3% (2/60) of individuals affected by multiple fractures. However, none of the differences in crude prevalence between the collections were statistically significant (Table 7.39).

Table 7.39: Crude Prevalence of Single and Multiple Fractures by Skeletal Collection

COLLECTIONS	N	SINGLE FRACTURE		MULTIPLE FRACTURES	
		AFF	%	AFF	%
St Nicholas Shambles (GPO75)	218	37	17.0%	20	9.2%
St Lawrence Jewry (GYE92)	60	6	10.0%	2	3.3%
Spital Square (NRT95)	48	4	8.3%	4	8.3%
St Mary Spital (SRP98)	5400	693	12.8%	436	8.1%
London Blackfriars (PIC87)	56	5	8.9%	4	7.1%
St Mary Graces (MIN86)	361	53	14.7%	32	8.9%
St Benet Sherehog (ONE94)	21	3	14.3%	3	14.3%
TOTAL	**6164**	**801**	**13.0%**	**501**	**8.1%**

Males had a higher crude prevalence of multiple fractures than subadults, but not females ($\chi^2 = 155.74$, df = 2, $p < 0.001$, $\Phi_c = 0.16$; Table 7.40). A similar distribution was seen in terms of single fractures ($\chi^2 = 183.35$, df = 2, $p < 0.001$, $\Phi_c = 0.18$). There were no differences between the collections in terms of males presenting with multiple fractures (Table 7.41). Conversely, there was a significant difference between the females presenting with multiple fractures from each collection (Fisher's Exact Test: $p = 0.02$, $\Phi_c = 0.09$), although the relationship was weak. There were a larger number of females in the Spital Square (NRT85) and St Benet Sherehog (ONE94) collections presenting with multiple fractures than other sites. Subadults were rarely affected by multiple fractures with only 0.5% (6/1237) affected.

Table 7.40: Overall Crude Prevalence of Single and Multiple Fractures by Sex

SEX	N	SINGLE FRACTURE		MULTIPLE FRACTURES		NO FRACTURE	
		AFF	%	AFF	%	AFF	%
Males	2483	463	18.6%	308	12.4%	1712	68.9%
Females	2058	262	12.7%	162	7.9%	1634	79.4%
Subadults	1237	34	2.7%	6	0.5%	1197	96.8%
TOTAL	**5778**	**759**	**13.1%**	**476**	**8.2%**	**4543**	**78.6%**

Table 7.41: Crude Prevalence of Single and Multiple Fractures by Sex and Collection

COLLECTIONS	MALES					FEMALES				
	N	SINGLE FRACTURE		MULTIPLE FRACTURES		N	SINGLE FRACTURE		MULTIPLE FRACTURES	
		AFF	%	AFF	%		AFF	%	AFF	%
St Nicholas Shambles (GPO75)	53	17	32.1%	7	13.2%	60	11	18.3%	6	10.0%
St Lawrence Jewry (GYE92)	14	3	21.4%	2	14.3%	18	2	11.1%	0	0.0%
Spital Square (NRT95)	20	2	10.0%	2	10.0%	7	1	14.3%	2	28.6%
St Mary Spital (SRP98)	2238	403	18.0%	271	12.1%	1889	237	12.5%	143	7.6%
London Blackfriars (PIC87)	16	3	18.8%	2	12.5%	12	1	8.3%	2	16.7%
St Mary Graces (MIN86)	135	35	25.9%	23	17.0%	67	9	13.5%	7	10.4%
St Benet Sherehog (ONE94)	7	0	0.0%	1	14.3%	5	1	20.0%	2	40.0%

7.6 CHRONOLOGICAL DIFFERENCES

Possible changes in patterns and prevalence of fractures over time were analysed in two separate ways. In the first instance, the skeletal collections were split into two different time periods: early (11th-12th centuries) and late (13th-mid-16th centuries). While the time periods are of different lengths the statistics used for analysis account for this difference. In terms of crude prevalence, there were no statistically significant differences in the overall number of fractures between the two time periods, but there was a significant difference in terms of true prevalence with the earlier time period presenting with a great number of fractures ($\chi^2 = 21.311$, df = 1, $p < 0.001$, $\Phi_c = 0.01$; Table 7.42). The difference is still statistically significant when the St Mary Spital (SRP98) collection was omitted ($\chi^2 = 4.4236$, df = 1, $p = 0.04$, $\Phi_c = 0.01$; Table 7.43). However, the relationship was very weak in both instances.

Table 7.42: True Prevalence of Fractures by Time Category

TIME CATEGORY	N	AFF	%
Early	19407	106	0.5%
Late	661667	2277	0.3%
TOTAL	**681074**	**2383**	**0.3%**

Table 7.43: True Prevalence of Fracture by Time Category without St Mary Spital (SRP98)

TIME CATEGORY	N	AFF	%
Early	19407	106	0.5%
Late	47499	200	0.4%
TOTAL	**66906**	**306**	**0.5%**

In terms of sex differences, there was no significant difference between males from the early time period and males from the later time period (Table 7.44)[53]. The same was true of both females and subadults. However, while there was no statistically significant difference between the sexes from the later time period, there was a difference between the sexes in the earlier time period ($\chi^2 = 5.0055$, df = 1, p = 0.03, $\Phi_c = 0.19$).

Table 7.44: Crude Prevalence of All Fractures by Sex and Time Category

TIME CATEGORY	MALES			FEMALES			SUBADULTS		
	N	AFF	%	N	AFF	%	N	AFF	%
Early	67	29	43.3%	78	19	24.4%	78	3	3.8%
Late	178	68	38.2%	91	25	26.0%	126	4	3.2%
TOTAL	**245**	**97**	**39.6%**	**169**	**44**	**20.7%**	**204**	**7**	**3.4%**

There was no significant difference in the crude or true prevalence of skull fractures either in total or between the sexes. When sorted into cranial vault and facial fractures, there were also no significant differences in terms of the overall number of fractures to that skull region. However, while there was no statistically significant difference between males and females in terms of cranial vault fractures from the later time period, there was one in the earlier time period, with more males affected than females (Fisher's Exact: p = 0.03, Φ_c = 0.23; Table 7.45). Males and females from the earlier time period actually had an

[53] SRP98 is omitted in this instance. While the significance remains the same when it is included, the relationship becomes very weak.

even more similar age-at-death profile than their later counterparts, which may be contributing to this difference. There were also no significant differences between the sexes in terms of facial or dental fractures.

Table 7.45: Crude Prevalence of Cranial Vault Trauma by Sex and Time Category

TIME	MALES			FEMALES			SUBADULTS		
CATEGORY	N	AFF	%	N	AFF	%	N	AFF	%
Early	40	8	20.0%	38	1	2.6%	44	1	2.3%
Late	134	12	9.0%	58	4	6.9%	85	2	2.4%
TOTAL	**174**	**20**	**11.5%**	**96**	**5**	**5.2%**	**129**	**3**	**2.3%**

In terms of rib fractures, there were no statistically significant differences in crude or true prevalence. However, while there was no difference between males and females presenting with rib fractures in the early time period, there was a significant difference between the sexes in the late time period ($\chi^2 = 58.836$, df = 1, $p < 0.001$, $\Phi_c = 0.03$; Table 7.46), which is further exacerbated by the fact that unlike in the earlier time period males had a slightly younger age-at-death profile than females. However, the relationship was very weak. In terms of metacarpal fractures, there were no significant differences between time periods.

Table 7.46: True Prevalence of Rib Fractures by Sex and Time Category

TIME	MALES			FEMALES			SUBADULTS		
CATEGORY	N	AFF	%	N	AFF	%	N	AFF	%
Early	946	4	0.4%	1022	2	0.1%	827	0	0.00%
Late	38080	341	0.9%	31281	129	0.4%	17035	6	0.04%
TOTAL	**39026**	**345**	**0.9%**	**32303**	**130**	**0.4%**	**17862**	**6**	**0.03%**

In the second instance, trends within individual collections were assessed. There were three collections in which the skeletons could be dated to at least two discrete time periods. In St Lawrence Jewry (GYE92), sixteen skeletons were dated to 1050-1140 and 41 were dated to 1140-1230. The demographic profiles between the two time periods were similar. In terms of overall fracture

prevalence, there was a statistically significant difference between the two time periods with a greater number of individuals injured in the earlier time period than in the later (Fisher's Exact Test: p = 0.25, Φ_c = 0.3; Table 7.47). There was also a statistically significant difference in terms of trauma that could be attributed to violence (in this case cranial vault and rib fractures), once again with the individuals from the earlier time period presenting with more trauma (Fisher's Exact Test: p = 0.02, Φ_c = 0.29; Table 7.48).

Table 7.47: Crude Prevalence of All Fractures in GYE92 by Time Period

TIME PERIOD	N	AFF	%
1050-1140	16	5	31.3%
1140-1230	41	3	7.3%
TOTAL	57	8	14.0%

Table 7.48: Crude Prevalence of VRIs in GYE92 by Time Period

TIME PERIOD	N	AFF	%
1050-1140	16	4	25.0%
1140-1230	41	1	2.4%
TOTAL	57	5	8.7%

When broken down into the sexes the overall numbers became quite small, making it difficult to assess statistically significant differences. However, a difference was seen in the overall number of fractures between females, with the females from the earlier time period presenting with more fractures than those from the later one (Fisher's Exact: p = 0.05, Φ_c = 0.4; Table 6749).

Table 7.49: Crude Prevalence of All Fractures in GYE92 by Time Period and Sex

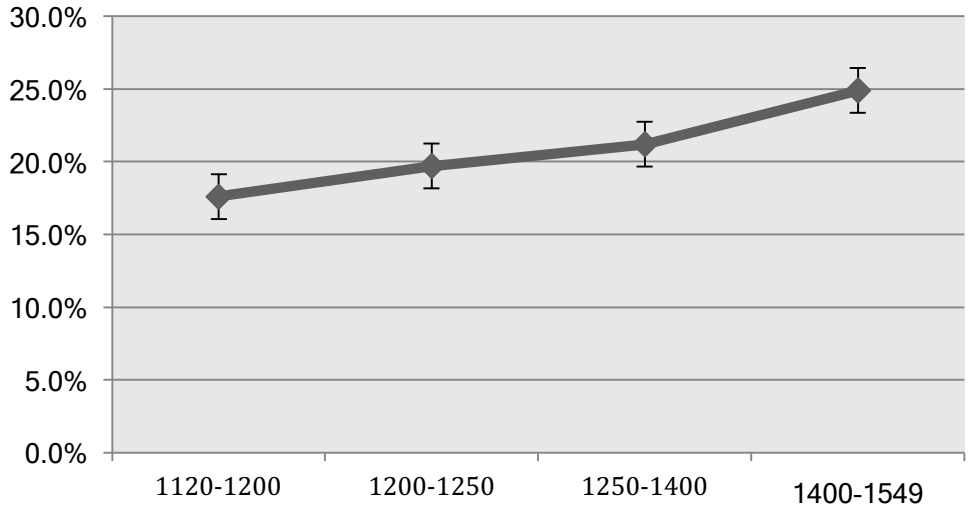
TIME	MALES			FEMALES		
PERIOD	N	AFF	%	N	AFF	%
1050-1140	6	3	50.0%	4	2	50.0%
1140-1230	9	2	22.2%	12	0	0.0%
TOTAL	**15**	**5**	**33.3%**	**16**	**2**	**12.5%**

Individuals from the St Mary Graces (MIN86) collection were also dated to different time periods. Excluding the individuals from the western cemetery, as they came from a different living population as the rest of the collection, there were two distinct time periods discovered. There were twelve individuals dated

to between 1353-1400 and 86 individuals dated to between 1400-1538. The demographic profiles were similar between the two time periods and no statistically significant differences were found between them.

The third collection with discrete time periods was the St Mary Spital (SRP98) collection. This collection had four distinct periods: 1120-1200, 1200-1250, 1250-1400, and 1400-1549. The demographic profiles were similar throughout. Regarding the total number of fractures, there was a steady increase in crude prevalence over time, a difference that was statistically significant (Figure 5.7; χ^2 = 11.066, df = 3, p = 0.01, Φ_c = 0.05; Figure 7.9), although the relationship is weak. There was no difference in terms of true prevalence.

Figure 7.9: Crude Prevalence of All Fractures by St Mary Spital (SRP98) Time Period



In terms of crude prevalence, there was no significant difference between skull fractures. Nor was there any difference in crude prevalence when the skull fractures were broken down into cranial vault and facial fractures. However, there was a difference in the true prevalence of skull fractures with a significant increase between period 1200-1250 and 1250-1400 (χ^2 = 17.105, df = 3, p <

0.001, $\Phi_c = 0.02$; Figure 7.10). There were also differences in the true prevalence of cranial vault fractures, with a significant increase between period 1200-1250 and period 1250-1400 ($\chi^2 = 27.573$, df = 3, $p < 0.001$, $\Phi_c = 0.03$; Figure 7.11). There were no statistical differences between periods 1120-1200, 1200-1250, and 1400-1549. Facial fractures had a slightly dissimilar distribution, but there were no significant differences in terms of true prevalence.

Figure 7.10: True Prevalence of Skull Fractures by SRP98 Time Period

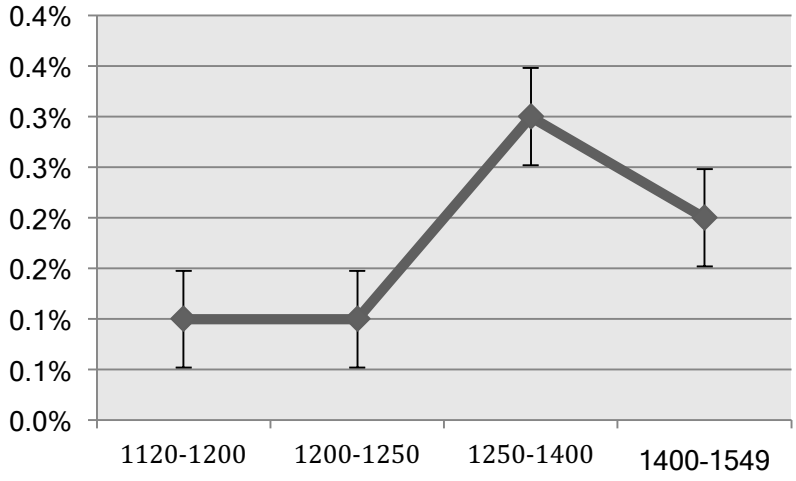
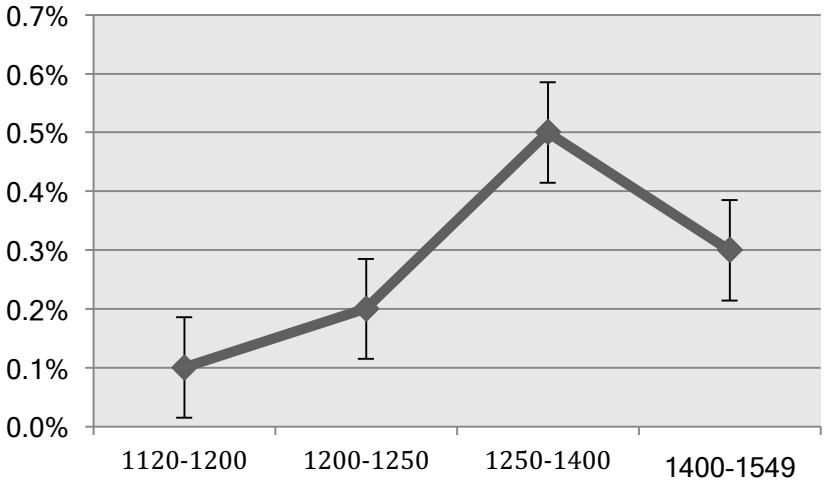


Figure 7.11: True Prevalence of Cranial Vault Fractures by SRP98 Time Period



Regarding rib fractures, there was a significant difference in the crude prevalence of rib fractures over time ($\chi^2 = 46.942$, df = 3, $p < 0.001$, $\Phi_c = 0.2$;

Figure 7.12). Period 1200-1250 presented with fewer rib fractures compared to the other time periods, while period 1250-1400 presented with a greater number than expected. This pattern was similar to the pattern of the true prevalence of rib fractures ($\chi^2 = 31.476$, df = 3, $p < 0.001$, $\Phi_c = 0.02$; Figure 7.13). Periods 1120-1200 and 1400-1549 presented with a lower true prevalence of rib fracture than other periods whereas period 1250-1400 presented with a greater number.

Figure 7.12: Crude Prevalence of Rib Fractures by SRP98 Time Period

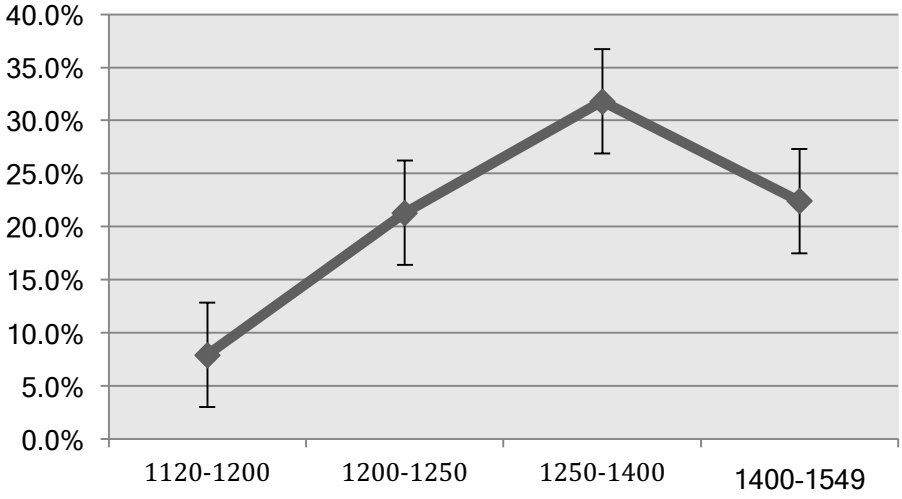
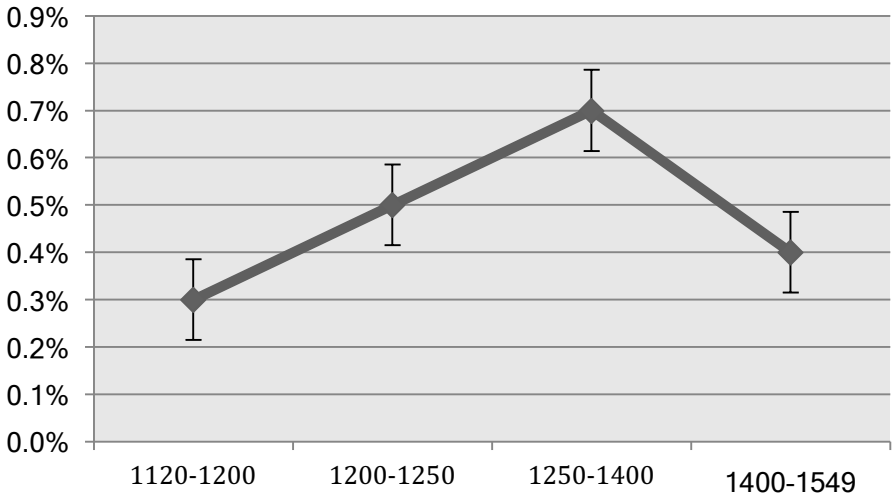


Figure 7.13: True Prevalence of Rib Fractures by SRP98 Time Period



7.7 CONCLUSIONS

The full meaning of these results will be discussed in the next chapter, but this section synthesises some important points that were illuminated above. For one, St Mary Spital (SRP98) for the most part was the least affected by all types of trauma, particularly those that may be violence-related. Overall, this difference is possibly due to the fact that this collection had a younger age-at-death profile than the rest of the collections, with the exception of London Blackfriars (PIC87). Interestingly, while London Blackfriars (PIC87) had a similar age-at-death distribution to St Mary Spital (SRP98) it did not present with a similarly lower percentage of trauma. The reason for this is unclear, but the smaller sample size of the Blackfriars collection could be affecting its ability to be accurately compared to the other collections.

While for some types of trauma there were no discernible differences between the sexes, in the cases where there were, males presented with more trauma than females. As would be expected, the age distributions for all types of trauma showed an accumulation of fractures with age. In terms of differences between the cemetery types, a few differences were seen with the most interesting being that males from the lay cemeteries presented with significantly more skull fractures than males from the monastic cemeteries. Differences in time were more difficult to appreciate and no major patterns were discerned. However, in the St Mary Spital (SRP98) collection, all types of fractures seem to peak at the 1250-1400 time period, the reason for which is uncertain but will be discussed further in the next chapter.

CHAPTER 8: DISCUSSION

The data from this study obviously do not provide a complete picture of violence in medieval London. The sample of skeletons only represents a small fraction of the individuals who lived and died in London throughout the medieval period, and its ability to accurately reflect the true population of London is uncertain (see Chapter 2 section on the osteological paradox). Nonetheless, this data can offer suggestions of what violence in medieval London may have been like, particularly by fixing the results within the social, political, and economic contexts of the period, as this chapter does.

The results from this study reveal that violence in medieval London may not have been a straightforward or easily predictable behaviour. There was not a clear delineation between the sexes, between individuals from different burial locations, or even over the six centuries represented by the collections. In order to understand the nature of violence in medieval London, smaller patterns and individual case studies must be analysed and placed within their historical and archaeological context. This chapter synthesises the data recorded in the previous results chapters, and reconciles it with what is already known about medieval violent behaviour more generally (as highlighted in Chapter 3) and the lives of the medieval Londoners interred in the collections more specifically (as outlined in Chapter 4), using methodologies outlined in Chapters 1, 2, and 5.

The first section of this discussion focuses on the overall prevalence of different types of trauma, both accidental and violence-related, present in the collections.

It is then compared with evidence from other medieval archaeological sites and historical evidence in order to aid in the possible interpretations of what types of behaviour may have caused these injuries. The next sections focus on similarities and differences in the prevalence of violence seen between the London collections, other medieval archaeological collections, and the historical record in terms of sex, age, burial location, and time. Possible interpretations of these results are postulated in each section. The last section looks at patterns of violence-related injuries. They are compared with other archaeological and historical evidence to help determine possible characteristics of violent assault in medieval London, such as common use of certain types of weapons, the direction of assault, and potential instances of interpersonal or collective violence. While violence is the main focus of this analysis, all forms of trauma are examined as they provide a point of comparison with violence-related injuries.

8.1 OVERALL PREVALENCE

In this section, the prevalence of all fractures observed in the London collections are interpreted, supported by evidence from the historical record. The results are then compared with other medieval skeletal collections to determine how medieval London may have differed from the rest of England. Overall fracture prevalence is discussed first, and skull fractures possibly indicative of violence are discussed secondly. It should be noted that the following discussion only accounts for injuries that affected the bone; soft tissue injuries cannot be accounted for, although they certainly would have existed.

8.1.1 PREVALENCE OF ALL BONE FRACTURES: An Urban Anomaly?

Roughly 21% (1307/6165) of individuals analysed in this research, presented with at least one fracture. The skeletal collections varied from 28.6% of individuals affected in St Benet Sherehog (ONE94) to 13.3% at St Lawrence Jewry (GYE92). Despite this large difference in overall prevalence, no collection differed significantly from each other, indicating that fracture prevalence was similar between these collections.

The overall prevalence is comparable to other contemporaneous sites from medieval England, but mainly those in rural locations. The town of Wharram Percy (10th-16th century) in the Yorkshire Wolds presented with an overall crude prevalence of 19.2% (60/360) and the medieval farming village of Raunds (10th-12th century), located in the Nene Valley of the East Midlands, had a crude prevalence of 19.4% (33/170; Judd and Roberts, 1999; Mays *et al.*, 2007). Conversely, individuals from other urban areas had a lower frequency of bone fracture. St Helen-on-the-Wall (10th-16th century) in York presented with a crude prevalence of 5.5% (29/532), while the Blackfriars (1263-1538) in Ipswich had a 4.7% (10/212) crude prevalence of fracture (Grauer and Roberts, 1996; Mays, 1991). However, another York site, the medieval cemetery of St Andrew, Fishergate (11th-16th century), had a more similar crude prevalence of 16.2%[54] (65/402; Stroud and Kemp, 1993: 266). Based on these figures it appears that the combined collections from this study presented with a crude prevalence of bone fracture more similar to rural individuals than those living in other urban settings. This finding goes against current theories, which propose that fractures

[54] This figure does not include the individuals with perimortem battle-related trauma.

were more common in rural life due to the hazards of farming, while urban dwellers encountered fewer risks from their craft/trade-oriented occupations (Grauer and Roberts, 1996; Judd and Roberts, 1999).

While this does not explain the high prevalence in the other London collections, St Mary Spital (SRP98) may have had a high overall prevalence of bone fracture because of their interment of invalids, who may have had a higher risk of fracture than the average person. The individuals interred at the Chichester leper hospital (12th-17th century) also presented with a high crude prevalence (15.1%), which Judd and Roberts (1998) argue is due to the visual impairment and loss of sensory perception that is common in people suffering from leprosy. While no cases of leprosy appear in the St Mary Spital (SRP98) collection, other diseases and infection can also make one prone to accidental injury. This does not, however, explain the high fracture prevalence seen in the other London cemeteries, which did not necessarily inter a high invalid population.

A more convincing argument is that the London population differed uniquely from other urban centres in medieval England. London did attract an overwhelming number of rural migrants, even more so than other urban centres in England (Dyer, 2002: 193). The London population grew exponentially between the 12th and 14th centuries, beginning with a population of 15,000 in 1066, rising to 40,000 in 1200 and then doubling to 80,000 by 1300 (Billings, 1994). The majority of this growth was due to a large influx in immigration, and not to an increased birth rate. After the decimation of the population due to the famines and plagues of the 14th century, the levels of migration slowly grew

again during the 15th century, but the population did not reach 80,000 again until the middle of the 16th century (ibid). This higher fracture prevalence may reflect injuries that originally occurred in a rural setting, before the individuals migrated to the city.

This theory is supported by the fact that in Chapter 4 it was hypothesised that rural migrants are likely to have comprised a large percentage of individuals in every collection. In particular, as a hospital, St Mary Spital (SRP98, NRT85) would have taken in many migrants on their way into the city, giving them food and providing shelter (Thomas *et al.*, 1997: 39, 41). Any migrants who died while in their care are likely to have been buried in the main cemetery. Rural migrants might have also been interred in several other London sites, specifically the lay burial sites of St Nicholas Shambles (GPO75), St Lawrence Jewry (GYE92), St Benet Sherehog (ONE94), and the western cemetery of St Mary Graces (MIN86).

Against the rural migrant theory is the fact that the overall fracture prevalence was high even in collections where rural migrants were unlikely to have been interred, such as London Blackfriars (PIC87), and the abbey precinct burials from St Mary Graces (MIN86). These collections predominately interred wealthy London craftsmen and merchants, who mainly came from firmly established London families, and members of the aristocracy (see Chapter 4). A few prominent citizens of London did start off life as poor rural migrants, who then made a more prosperous life for themselves through crafts and trades, but they were not the standard (Cherry, 1992: 13).

A stronger theory proposes that while the overall prevalence between the London collections and rural sites may be the same, the pattern of injury may differ. In the rural sites, there was a high prevalence of long bone fractures, particularly of the clavicle, radius, and fibula. Fractures at these locations are usually associated with falls or other types of accidents. The London collections presented with a different fracture pattern, where the vertebrae and ribs were predominately affected. Clavicle fractures only had a crude prevalence of 0.9% compared with a 7.0% crude prevalence from the Raunds site (Boddington, 1996: 118). Fibula fractures from the London collections had a slightly higher crude prevalence at 1.2%, but that was still significantly lower compared with the 7.0% fractured at Raunds. Conversely, no individuals from Raunds presented with spine or rib fractures (ibid). Interestingly, the individuals from the St Andrew, Fishergate cemeteries presented with a similar fracture pattern to those of the London collections, with the ribs and the spine being the most commonly affected locations of bone fracture (Stroud and Kemp, 1993: 226-7). This similarity may indicate that rib and spine fractures were a common injury in urban populations. This is further supported by Lewis's (2016) study on medieval subadults, which found a similar difference in fracture pattern between urban and rural children. The reasoning for this difference in fracture pattern may reflect differences in occupational hazards. The uneven terrain of farm fields may have led to more long bone fractures, while the crafts and trades of Londoners may have required them to participate in more "back-breaking" labour. The stress of cleaning on one's hand and knees (for women in domestic service) or lifting heavy materials and using dangerous tools (for men in

apprenticeships) may have caused more rib and vertebrae fractures (Lewis, 2016).

It may also be that the frequency of fractures reported in the site reports from other urban sites were underreported. Certainly, the crude prevalence of fractures from the St Nicholas Shambles (GPO75) site has previously been reported at only 4.1% (12/296; Judd and Roberts, 1999). That is very different from the prevalence of 26.1% (57/218) that was identified in this study and may be caused by the overlooking of subtler trauma during the process of rapid scanning of skeletons for the purpose of a site report. It is possible that a similar level of underreporting has occurred in other sites, particularly those in which trauma was not the sole focus of the study.

8.1.2 SKULL FRACTURES

Approximately 4.3% (209/4882) of all individuals in the combined collections presented with at least one fracture to the skull consistent with violence. If St Mary Spital (SRP98) is omitted, this rises to 10.9% (48/440). The individuals from St Nicholas Shambles (GPO75), Spital Square (NRT85) and St Mary Graces (MIN86) presented with the highest prevalence of skull fracture, which were significantly higher than the other sites. The individuals from St Mary Spital (SRP98) presented with the lowest percentage at 3.6% (161/4442), which was significantly lower.

Overall, this was a higher percentage of skull fractures than in other medieval sites, rural or urban. Regarding rural sites, the Yorkshire village of Wharram Percy had a crude prevalence of 2.8% (10/360), while at Raunds no skull fractures have been reported (Boddington, 1996: 118; Mays *et al.*, 2007: 144-45). In medieval York, the prevalence varies by cemetery with the Jewish burial ground at Jewbury (12th-13th century) presenting with a crude prevalence of 3.6% (9/249[55]) and St Helen-on-the-Walls presenting with 2.1% (11/532; Dawes and Magilton, 1980: 56; Lilley *et al.*, 1994: 476-81). As with the crude prevalence of all bone fractures, the cemeteries at St Andrew, Fishergate presented with the most similar prevalence of skull fractures with 4.2% (17/402) affected, although it is still nowhere near as high as the crude prevalence without St Mary Spital (Stroud and Kemp, 1993: 225-38).

The discrepancy in skull fractures between the London collections and the rest of medieval England may be even higher than reported since none of the studies listed above focused solely on violence-related injuries. As such, at least some of the fractures from the other studies may include trauma not consistent with violence, meaning that the actual prevalence of violence-related skull trauma may even be significantly lower than the figures presented here. Tentatively, these results may indicate that the prevalence of violence-related skull injuries was significantly greater in medieval London than in the rest of England. This is supported in Lewis's (2016) study on subadults, where she found that urban children presented with more face, rib, and teeth fractures than their rural counterparts. Boys were particularly affected as would be expected, but she also

[55] Skeletons with 80% completeness

found that girls begin to exhibit a similar fracture pattern after 18, the age at which they may be expected to marry, possibly indicating the presence of spousal abuse.

8.1.2.1 INVALIDS, MIGRANTS, AND THE POOR: Immune to violence?

The reasons behind the lower prevalence of skull fractures amongst individuals from the St Mary Spital collection are not immediately apparent. It might be that since the site had a younger age-at-death profile than most of the other collections, the individuals buried there did not have as many years to accumulate skull fractures. However, a similar difference was not seen when all fractures were analysed and since violence is usually a behaviour most often associated with the relatively young[56] (Hussain *et al.*, 1994; Judd, 2002), this explanation is not completely compelling, especially since the same pattern was not seen in the London Blackfriars collections, which had a similarly young age-at-death profile.

The difference might instead be reflective of an actual dearth of violent behaviour against these individuals. The clergy, poor, invalids, and rural migrants, who were predominately interred in the St Mary Spital cemetery, might not have been individuals who were susceptible to violence. This is, in part, supported by the fact that the overall crude prevalence of skull fractures appears to be quite low in medieval rural populations, from where many of these individuals might have originated (see above; Chapter 4). Skeletons from other

[56] This is further supported by the data in this thesis, which showed that the rate of violence-related skull fracture accumulation slowed earlier in life than for all fractures (see age distributions in Chapter 7).

medieval hospitals also show that skull fractures were rare amongst invalids. At the Chichester leper hospital, 15.1% of individuals presented with at least one fracture, but none were located on the skull. Similar to rural sites, the long bones were predominately affected, particularly the clavicle, radius, and fibula, with 26.8%, 17.1%, and 19.5% affected respectively (Judd and Roberts, 1998). St Bartholomew's Hospital (12th-16th century) in Bristol had an overall crude prevalence of 23.3% (7/30) and a long bone fracture frequency of 6.6% (2/30; Price and Ponsford, 1998). However, unlike the leper hospital and the rural sites, St Bartholomew's presented with a relatively high crude prevalence of skull fractures at 6.6%[57]. The mixed results of these comparisons do not make this argument any more tenable.

A more in-depth look at the evidence shows that while the overall crude prevalence of skull fractures may be low, those that were affected appear to have been prone to multiple violent transgressions. Unlike with crude prevalence, there was no difference in the true prevalence of skull fractures between the different skeletal collections. And in fact, St Mary Spital (SRP98) presented with one of the highest true prevalence rates with 0.6% of all skull bones affected by at least one fracture. This dichotomy indicates that a relatively small number of individuals presented with a large number of skull fractures. Thus, while the majority of the individuals interred in the St Mary Spital cemetery may not have been affected by violence that led to skull fractures, a small subset of the population was. Unfortunately, it is impossible to know exactly which subset of the population these individuals represent.

[57] Two individuals, both with depression fractures to the cranial vault.

Of note, is the fact that the early infirmary cemetery at St Mary Spital, identified as the Spital Square collection (NRT85) in this research, presented with a crude prevalence of skull fractures that was significantly higher than the later infirmary cemetery of St Mary Spital (SRP98). It would be expected that the two cemeteries would have interred a similar living population, thus the only difference between the two sites would be that the main cemetery (SRP98) interred individuals from other segments of the medieval population as well, including the clergy and wealthy benefactors (see Chapter 4). This could potentially indicate that, the group in the main cemetery most affected by multiple skull fractures may be the same group that was affected in the Spital Square site, namely the hospital inmates.

Additionally, recording bias may also be to blame for the lower skull fracture prevalence seen in the St Mary Spital (SRP98) collection, particularly since it is the only collection that was analysed by external researchers and violence was not the sole focus of the analysis. As noted above, the rapid scanning of skeletons for the purposes of a site report may cause subtler trauma to be overlooked.

8.1.2.1 CRACKED SKULLS: Lower status and violent?

Just as St Mary Spital (SRP98) might have been particularly unaffected, the individuals from St Nicholas Shambles (GPO75) and St Mary Graces (MIN86) may have been disproportionately affected by skull fractures consistent with violence since 12.1% (12/99) and 12.5% (26/208) were affected respectively. Possibly explaining this pattern is the fact that these two collections interred

some of the lowest status individuals represented in this study. While the parishioners of St Nicholas Shambles (GPO75) did not comprise the poorest individuals in medieval London, the parish was poorer than the other lay sites in this study (Chapter 4). The western cemetery from the St Mary Graces (MIN86) precinct, which accounted for the majority of skull trauma in the collection, was used as a burial site for victims of the later waves of the Black Death (1350-1400). It was most likely comprised of a mixture of individuals of various social statuses, although probably more individuals of lower and middling status than those of high status (see Chapter 4 for a full discussion on the social status of these individuals). As such, it is the site researched in this study that most likely includes individuals of particularly low status. This theory is explored in more detail in section 8.4.

8.2 SEX DIFFERENCES

Males and females were not equally affected by bone fractures. Males were almost twice as likely to present with at least one bone fracture than females. This separation most likely indicates a division in labour, with men partaking in either occupational or recreational activities that predisposed them to injury more so than women. Male Londoners participated in a wide range of occupations, ones that would not necessarily cause similar fracture patterns. But, many crafts would have been at least mildly labour intensive, particularly butchery and metalworking, two professions that were likely represented amongst individuals from the St Nicholas Shambles and St Lawrence Jewry sites (see Chapter 4). While trading professions, such as mercery, may have been less

physical, they required extensive travel, which as shown in Chapter 4 could be quite hazardous whether from accidents or being attacked by highwaymen or pirates.

Women, on the other hand, predominately worked within the home (Jewell, 1996: 70). While they were permitted, in times of good economy, to work, travel, and provide financially for the family, society in general, and the Church more particularly, encouraged women to remain in the home and carry out their wifely and motherly duties (ibid: 4, 70). As the 14th century poem *How the Good Wife Taught Her Daughter* prescribed:

> Dwell at home, daughter, and love thy work much,
> And so thou shalt, my lief child, wax the sooner rich.

It was considered better for the woman, and for the family as a whole, if she stayed at home when she could, and, as Hanawalt (1993) has found based on accidental death records, this rule seemed to have been obeyed. Fifty per cent of female accidental deaths occurred in the home and were often sustained while doing the household chores, whereas only 20% of male accidental deaths occurred in the house. While there were obvious hazards in the average London household (i.e. steep ladders, fires, etc.), it may be that household work was inherently less risky than male occupations.

If women did work it was usually in victualing type trades, such as baking or brewing (Leyser, 1995: 138-41). While burn injuries may have been common with this type of work, they would not have affected the bone and hence are invisible to the skeletal record. There is evidence of a few women participating in

slightly more labour-intensive occupations, such as butchery and metalworking, but they seem to have been completely absent from the particularly dangerous professions such as construction (Jewell, 1996: 92; Sabine, 1933). Most often a woman worked in conjunction with her husband, but in some cases women, particularly widows, were able to trade as *femmes sole* (Barron, 1989). In all, the number of women that would have faced the same labour risks as men would have been relatively small.

Interestingly, the ratio of fractured individuals and uninjured individuals between the sexes appears to be quite similar to modern patterns in England, where 10% more men present with at least one bone fracture than women (Donaldson *et al.*, 2008). This consistency perhaps suggests that women are naturally more risk averse than men, and hence less prone to injury in general (Borghans *et al.*, 2009).

8.2.1 SKULL FRACTURES

Males presented with a greater number of skull fractures than would be expected by chance. However, the strength of the relationship suggests that this is not as clear of a finding as would be expected given the historical record and theories on violence, which infer that men were naturally more violent than women (Gottfredson and Hirschi, 1990: 45). Men were predominately both the perpetrators and victims of violence according to court and coroners' rolls from medieval London as well as throughout England (see Chapter 3; Hanawalt, 1979). Women hardly feature in these rolls, suggesting a sharp divide between

the two sexes regarding violent behaviour (ibid). If historical records are solely referenced, it would appear as though women were rarely affected by violence in medieval London.

To be sure, females from the collections did present with a lesser number of skull fractures than expected, but the strength of the relationship suggests that this result is insignificant. This indicates that while females may have been less affected by skull trauma consistent with violence, they were hardly immune to it. This finding, in combination with the strong statistical difference seen between the sexes in terms of overall fracture prevalence, demonstrates that there was a more distinct difference between the sexes in terms of accidental injury than violence-related ones.

As noted above, the documentary evidence does not support the lack of distinction between males and females regarding skull fractures. In only eleven homicide inquests, out of 140 (7.7%) from the London Coroners' Rolls was the victim female (see Chapter 3). Court and coroners' rolls from other English counties also support a very low involvement of women in violent attacks (Hanawalt, 1979; Butler 2001). However, as these records only provide information on homicide victims, this discrepancy may indicate that while women were subjected to violence, it was rarely fatal.

Equally, there may be a gap in the historical records. As evidenced in Chapter 3, since the church actually encouraged corporal punishment against one's wife, this behaviour was not considered to be a form of violence unless the woman

was killed. This means that domestic violence was rarely recorded in court records or other official records. Due to the acceptance of domestic violence in medieval society, some scholars have posited that wife-beating may have been a fairly common practice (Bennett, 1987: 103; Butler, 2006a), and the skeletal evidence seems to support that theory. However, this reasoning should be qualified with the fact that identifying domestic violence in the skeletal record is not easily done, especially since there are no specific fracture patterns that point to such behaviour (Chapter 2; Redfern, 2015). Still, it remains a possible interpretation for these injuries, particularly since the historical record does not support any other explanation.

8.3 AGE DIFFERENCES

For both overall trauma and violence-related trauma, there was an accumulation of bone fractures with increased age. The pattern for all fractures, seen in Figure 7.2, shows that the risk of fracture increased with age, until the mid-forties when the prevalence plateaued. This is an expected pattern, as the longer one lives, the more time one has to fracture a bone. It might also be expected that bone fracture would increase significantly in the oldest age groups due to more brittle bones and a decrease in balance and agility. However, this is not seen in the pattern here, where the number of fractures plateaued in the 36-45 age group. This discrepancy may be due to the fact that there are currently no completely accurate aging techniques for older adults, making it so as we cannot definitively distinguish between adults aged 45 and those aged 85. If there were a greater number of 45 year olds making up the >45 age group this could skew the

percentage towards the younger end. Supporting this theory are the age demographics, which show a smaller percentage of individuals older than 45 found in these collections, compared with younger adults and subadults, suggesting that the overall life expectancy was low. Thus, not many people may have lived long enough to develop senile diseases such as osteoporosis that would have predisposed them to bone fractures (Rachner *et al.*, 2011).

Another theory suggests that this pattern may also be caused by variation in risk relative to age. In Chapter 2, the osteological paradox and its application to trauma were discussed. It was suggested that being more prone to injury could also have an adverse effect on one's life expectancy. Conversely, it was also proposed that individuals with poorer health, and therefore a lower life expectancy, may be less prone to injury if their illness restricted risk-prone behaviour. The age distribution seen in the London collections supports this first theory, with those of younger age being more prone to injury and hence more likely to die younger.

A similar pattern is seen with skull fractures. Individuals aged 36-45 presented with the largest percentage of skull fractures, which was significantly higher than would be expected by chance. The percentage of skull fractures was lower in the >45 age group, although the difference was not significant. The pattern seen in Figure 7.5 indicates that an individual's risk of violence increased greatly with age but plateaued by the mid-forties. This is in keeping with both historical and modern accounts of violence, which suggest that the presence of violence decreases in old age (Hussain *et al.*, 1994).

8.3.1 CHILDREN AND VIOLENCE

London children were certainly not immune to injury. The London Coroners' Rolls tell of children being hit by neighbours, falling out of second storey windows, drowning in the Thames, and even being bitten by sows. Hanawalt (1993: 64), however, suggests that children growing up in a medieval urban environment were less likely to be injured than their rural counterparts, as they were better supervised: "In the city, the neighbors were always there, whereas in the countryside, the family and neighbors were in the fields, often having left the children with inadequate babysitters, such as older siblings or the disabled".

The skeletal evidence from this study does not fully support this assumption that childhood trauma, violence-related or otherwise, was relatively rare in medieval London. Over three per cent (40/1237) of subadults from the collections presented with at least one fracture. While this may not seem very high, other archaeological sites show that subadult fracture was even more sporadic in other areas of medieval England. No subadults from St Andrew, Fishergate or St-Helen-on-the-Walls presented with any fractures[58] and at Wharram Percy, subadults had a crude prevalence of 0.9% (3/327; Stroud and Kemp 1993: 225; Dawes and Magilton 1980: 56; Mays *et al.,* 2007: 144-45). Thus, while the London environment does not appear to have led to an exorbitant number of bone

[58] The site report (Dawes and Magilton 1980) does not list any subadult fractures. However, Lewis (1999; as sited in Lewis 2014: 48-51) reports three instances of subadult fractures: A 10-14 year old with a depression fracture on the right parietal, a 6-10 year old with a fractured mandible, and a 14-17 year old with a fractured tibia. With these incorporations, the crude prevalence of fracture for subadults is 0.9% (3/317). Once again, this discrepancy shows how site reports are missing some instances of trauma.

fractures amongst subadults, it may have been more dangerous than the rest of medieval England, either rural or urban. Lewis's (2016) study on medieval children sheds further light on this. She found that urban children presented with a high percentage of trauma (6.4%) than their rural counterparts (4.6%). But, when broken down into sexes this pattern seems to have been largely driven by boys, since rural girls presented with a greater fracture crude prevalence than urban girls. If this pattern holds true, this could mean that London boys were particularly prone to injury. However, since sex determination was not attempted in subadults in this study, this assumption cannot be verified.

The London Coroners' Rolls indicate that children were much more likely to be injured or killed by an accident than by violence. This pattern is upheld by the evidence from the skeletal data: of the 40 subadults with a fracture, only thirteen, 1.1% (13/1237) of the total subadult population presented with trauma possibly indicative of violence. The injury characteristics suggest that the injuries were caused by interpersonal violence: six with blunt force trauma to the cranial vault above the hat-brim line, four with isolated, transverse rib fractures (one of which also presented with a broken nasal bone), and two individuals with dental trauma, including significant antemortem tooth loss. All but one of the injuries was fully healed at the time of death. The exception was a subadult from the St Mary Spital (SRP98) collection who presented with a left rib fracture that was still in the process of healing at the time of death. Eleven of the subadults were aged 12-17 and two were aged 6-11. No subadults younger than six presented with a VRI. One of the subadults with a cranial vault depression

fracture to the left frontal was also severely affected by tuberculosis. Several vertebral bodies had collapsed which may have predisposed him/her to accident and injury.

Unfortunately, there are few studies with which to compare these results in order to suggest how prevalent violence against children in medieval London was compared to the rest of England. Lewis (2016) found that 21.2% of urban subadults presented with at least one skull fracture (compared to 20.5% of rural children), which would be significantly higher than what was discovered amongst the London collections. However, she does not distinguish between injuries that are likely caused by accident and those likely caused by violence, so it is difficult to compare the two results.

Overall, a much bigger discrepancy was seen between accidental and violence-related injuries amongst subadults than amongst adults, possibly suggesting that violence was more of an adult behaviour. The historical record appears to support a lack of childhood violence, with children rarely appearing as homicide victims in the London Coroners' Rolls. As noted in Chapter 3, there is only one inquiry from the rolls in which the victim was a child. The support for non-fatal child abuse is even scanter, with even fewer records supporting its existence than regarding spousal abuse[59]. Thus, if violence perpetrated against children, either by parents, community members, or other children (see Chapter 3), was

[59] While husbands were sometimes brought to court over excessively beating their wives, no cases exist of parents excessively beating their children.

common in medieval London, it most likely predominately affected the soft tissue.

Eleven of the subadults with violence-related skull trauma were from the St Mary Spital (SRP98) collection. Six were buried in mass pits while the other five were single inhumations. Of the other two, one was buried in the western cemetery of St Mary Graces and the other was buried in the early infirmary cemetery of St Mary Spital (NRT85). Many of the individuals buried at St Mary Spital were rural migrants, the invalid, and the poor. Additionally, the hospital also cared for, and likely buried, orphaned children (Thomas *et al.*, 1997: 104). As argued in Chapter 4, the individuals from the western cemetery of St Mary Graces most likely came from a middling to low status background. Thus, the majority of these children probably did not come from the wealthiest of households, if they had a family at all. In modern populations, child abuse is more prevalent in lower status households and foster homes (Pelton, 1978), and this may have been true even in the medieval period.

It should be noted, however, that orphan status did not always equate to outright poverty. Many of London's orphans inherited from their parents, and strict laws were in place to provide for them should they have need of it (Hanawalt, 1993: 89-90). However, this did not mean that abuse did not exist, and there are a few records in the City's Letter Books that list cases of abuse of an orphan by his or her ward, although the majority of abuse does not appear to have been physical (ibid: 100-104).

It is difficult to determine how well these findings reflect the actual prevalence of violence against children in medieval London. For one, subadult fractures are often difficult to identify[60]. As highlighted in the methods section, subadult bones have a greater plasticity than adult bones allowing for more robust remodelling (Currey and Butler, 1975; Lovell, 1997; Roberts and Manchester, 2005). This could mean that the number of subadult fractures is underrepresented in this study. Secondly, these numbers only reflect individuals who died during childhood. It is possible that these subadults may have been either more or less prone to injury, accidental or intentional, than their healthier counterparts who survived into adulthood and whose childhood injuries could not be distinguished (see Chapter 2).

8.4 DIFFERENCES IN CEMETERY TYPE

No difference was seen between the monastic (religious houses) and lay (parish churches) sites in terms of overall fracture prevalence. However, an interesting dichotomy that arose from the cemetery type findings was that males from the lay sites presented with a significantly greater number of fractures than the females, but there was no difference between the sexes from the monastic sites. Additionally, while the difference was not statistically significant, females from the monastic sites had a higher crude prevalence than females from the lay sites. There was no difference between males from the monastic and lay sites and the same was true of females. Combined, these figures appear to show a greater division in injury-causing activities between the sexes from the lay cemeteries

[60] Although skull fracture may be the easiest to identify in a subadult.

than between the sexes from the monastic sites. In terms of violence-related injuries, the only difference was seen in skull fractures. Despite there being no overall differences between the two cemetery types, there was a difference between males, with males from the lay sites presenting with significantly more skull fractures than males from the monastic sites. There was no difference between the females from each cemetery type.

To examine whether these are important findings or not, we must examine how the two cemetery types differed. One way of accounting for the observed differences between the two cemetery types is varying levels of religiosity. Arguably, the individuals buried in the monastic sites may have been more pious than individuals buried in lay cemeteries, particularly when comparing upper status Londoners who did not face financial restrictions in their burial choices. The pious members of the laity were perhaps more likely to worry about their soul in the afterlife, and hence may have purchased more chantries and became benefactors to religious houses in order to make sure they did not spend too much time in Purgatory (Daniell, 1997: 12-15). As such, they may have disproportionately chosen to be buried in their favoured religious house, instead of their local parish church.

In terms of the religious community buried in monastic sites, one might expect a lower fracture prevalence, one that is not apparent from the skeletal evidence. Monks, abbots, and other members of the Church, are unlikely to have participated in strenuous activity (although they may have on occasion helped with necessary renovations; see Chapter 4), leading relatively sedentary

lifestyles and enjoying a relatively high standard of living with access to food, clean water, and medical care (Gilchrist and Sloane, 2005: 210). While they would have travelled on occasion, perhaps moving between different religious houses, they would have spent the majority of their time within the monastic precinct. A lower prevalence of violence-related trauma might also be expected, as they were unlikely to have participated in violent activities such as training for battle or tournaments, being immune from military service. They were not completely invulnerable to violence, however, and there are recorded instances of lay neighbours attacking monasteries either due to land disputes or other neighbourly quarrels (Jamroziak, 2008: 45-46; Chapter 4).

In contrast, however, if the laity buried in monastic cemeteries adhered to a more religious life, a skeletal difference between them and the irreligious would not necessarily be apparent. Both are likely to have participated in similar occupations and been exposed to similar injury risks, perhaps accounting for the fact that there were no differences in the overall prevalence of trauma. Although, there may be an argument that the pious may have not partaken in particularly risky activities, including violence[61]. In terms of the difference between all fractures seen been females from both cemetery types, the pattern is not easily explained. As the difference does not appear to be reflected amongst violence-related injuries, we cannot assume that the difference is due to pious husbands following religious doctrine and using corporal punishment on their wives.

[61] However, the Crusades provide a strong argument against a peaceful worldview amongst the more religious.

There are obviously problems with this theory. For one, even the most irreligious in life may have become pious in the face of death. Signs of religiosity in wills and other testaments, including burial locations, do not provide any information on long-term charitable actions (Burgess, 1990: 16). Daniell (1997: 92-93) also argues against the assumption that religiosity was the main factor in the determination of burial location. He states, "the monasteries [and friaries] were the preferred choice, not because the person might have been a generous benefactor, but because it was the family's traditional resting place". This also appears to have been true for people from all social statuses, and not just for high status monastic burials (ibid: 101; Harding, 1992: 127).

If, as is often argued, piety could be bought (Crouch, 2001: 160-163; Hicks, 2008: 95; Rosenthal, 1972: 12-13), particularly in the two centuries before the Reformation, differences in social status might be another way of looking at dissimilarities between the two cemetery types. On average, particularly by the 13th century, monastic burials in London were mainly comprised of the clergy, who often came from well-off backgrounds, and the wealthy laity (Harding, 1992: 124). In terms of the religious population, osteological analysis of the mortality of males from both medieval monastic and lay sites suggests that monastic males enjoyed better diets and living conditions, more health benefits, and perhaps may even suggest selective recruiting of higher status individuals (DeWitte *et al.*, 2013).

Monastic burials were costly and were seen as a form of prestige, as such "…Londoners of higher mercantile and professional status seem to have had a

greater predilection for friary burial" (ibid). In particular, Harding (1992: 124) mentions that both the London Greyfriars and Blackfriars seem to have been popular amongst wealthy, distinguished Londoners. This predilection for monastic burials amongst those of upper status was perhaps aided and abetted by the religious community, who sought the money and prestige that came with high-ranking burials and often fought for the burial rites of wealthy individuals and/or families (Daniell, 1997: 91-92). Despite these points, middling status burials in the monastic houses did occur. But, they are more likely to be located in the cemetery rather than the religious buildings and were perhaps even less likely in the period between the Black Death and the Reformation when the cost of religious benefactions rose steeply (Gilchrist and Sloane, 2005: 62; Hicks, 2008: 97; Postles, 1996: 634).

Parish burials, on the other hand, were less expensive and mainly interred its parishioners, the social status of which depended on the neighbourhood in which the church was located (Harding, 1992: 124). In general "parochial burial was very much the rule among willmakers of the middling class in pre-Reformation London" (ibid: 122-125). Poorer Londoners were perhaps the most likely to choose burial in their parish cemetery as it was free, apart from paying the gravedigger (Gilchrist and Sloane, 2005: 63). If those of middling status chose not to be buried in their parish church, they most often chose to be buried in the town cathedral, which in London was St Paul's (ibid; Harding, 1992: 123).

If we analyse the differences in cemetery type in terms of social status, the immediate reaction is that this in an unusual find, as lower status individuals

should be at greater risk of injury, both accidental and violent, than their high-status counterparts. A closer look, however, reveals that being of higher status in medieval London did not necessarily equate to freedom from strenuous labour. Some of the wealthiest and most respected guilds in medieval London were the goldsmiths and the ironmongers, two professions that involved a fair amount of injury risk (see Chapter 4). The merchants and grocers on the other hand, other prosperous members of the London community, were relatively free from hard labour and probably had minimal risk of injury. However, they often travelled extensively for work and may have fallen victim to the numerous hazards of the road (Chapter 4).

Additionally, one would assume that high status women were particularly immune to risk of injury as they rarely partook in any strenuous activity, delegating the running of the household to servants (Jewell, 1996: 142). There is no clear explanation for this. Possibilities include wealthier women riding on horses or in carriages, and subsequently falling from them, more often than their middling status counterparts. They may have travelled more, exposing them to risks from assault during highway robbery. The falling/crashing scenario, in particular, is supported by the fracture pattern seen amongst females from monastic sites. In those sites, seven of the eleven (63.6%) fractured individuals presented with a long bone fracture, consistent with accidental injury. In contrast, only 39.1% (9/23) of females from the lay sites presented with a fractured long bone. Instead, they presented with a dispersed fracture pattern with injuries almost evenly distributed between the head, the extremities, the vertebrae, and the long bones. This fracture pattern may indicate that women

from the lay sites may have participated in more strenuous labour, such as household chores, which women of higher status would have employed servants to do.

Further support of the accident whilst travelling scenario for women from monastic sites is corroborated by a female of unknown age from the St Mary Graces (MIN86) churchyard (10493), who presented with a skull fracture that may have been caused by a high-velocity accident. The individual in question presented with a healed fracture to the right side of the mandible as well as a healed fracture to the right anterior facet of the C2 vertebra. While mandible fractures are often the result of an assault, when combined with a cervical vertebra fracture the cause in modern patients is most often from a motor vehicle accident, and rarely from assault (Craig and Hodgson, 1991; Hackl *et al.*, 2001). Craig and Hodgson (1991) assert that the mechanism of injury for coronal superior facet fractures of the axis, like the one seen in this individual, is lateral flexion, often at a high velocity. As it is impossible that this individual received these injuries in a motor vehicle accident, another high velocity accident, such as a fall from a horse or carriage, may be to blame.

Social status differences affecting the pattern of violence is further supported when the collections are analysed separately. As noted above in the section on overall prevalence, the individuals from St Nicholas Shambles and St Mary Graces presented with a greater number of skull fractures consistent with violence compared to the other collections, with the vast majority of skull fractures in the St Mary Graces collection attributed to the lower-status western

cemetery. The poorer population interred at the St Mary Spital site may also have present with a disproportionate number of skull injuries (see above). These three assemblages most likely interred the lowest status individuals represented in these collections (see Chapter 4 for more information on social status). This suggests that lower-status individuals were predominately affected by violence-related injuries affecting the skull, lending credence to the idea that social status may have contributed to the higher prevalence of skull fractures amongst males from the lay cemeteries than those from the monastic cemeteries. In summary, lower status males appear to have been disproportionately affected by skull trauma likely attributed to violence.

This finding is in keeping with the historical record. By mapping the homicides recorded in the London Coroners' Rolls, it can be shown that there was also a distinct lack of homicides in some of the richer wards of the city, such as the northern wards of Bassishaw, Coleman Street, and Cheap (see Chapter 2 for a more in-depth discussion of this pattern). This pattern would suggest that homicide amongst wealthy individuals was not a common occurrence, at least in the first half of the 14th century. Additionally, in the London Coroners' Rolls the overwhelming majority of perpetrators were poor with 71.6% owning nothing at all. Only eight of the cited perpetrators would probably have been considered wealthy (see Chapter 3 for reasoning). While the Coroners' Rolls tell us nothing about the social status of the victim, the inquiries indicate that the perpetrators and victims were often acquaintances and thus, most likely, from the same strata

of society[62]. Similar results were found by Given (1977) in his assessment of the London eyre rolls (Chapter 3). However, the limited timeframe represented amongst the London court and coroners' rolls (the late 13th century and first half of the 14th century) prevents us from extrapolating these findings to other centuries, meaning that how social status may have affected violence in other points of the medieval period is unknown.

Rib fractures depict a different scenario regarding social status and likelihood of violence. While there was a relationship between those interred in the parish lay cemeteries and a higher crude prevalence of skull fractures, there was no such difference seen regarding rib fractures. The monastic sites even presented with a higher crude prevalence of rib fractures than the lay sites, although the difference was not significant. The injury mechanism for rib fractures is also similar between the monastic and lay sites, with the majority being transverse fractures to the middle or sternal end of the rib with the siding about evenly split between left and right ribs. Apart from the St Mary Spital collection, which has already been shown to differ from the other monastic collections due to its status as a medieval hospital, the majority of the monastic rib fractures were found in the skeletons from the abbey precinct of St Mary Graces (1353-1538). The possible reasons for this high prevalence are discussed in the following section.

Overall, as with levels of piety, there are several problems with using burial location as a proxy for social status. Firstly, the delineation between burial

[62] While those of high status may have been injured by highwaymen or other robbers, cases like that do not show up with as much frequency in the court and coroners' rolls.

location is not absolute: wealthy individuals were known to have been buried in lay cemeteries (as seen in some of the known burials from St Benet Sherehog; Chapter 3) and monastic cemeteries may have sometimes buried the poor as a form of charity. Secondly, two of the collections interred individuals dated between the 11th and 12th centuries, before many of the religious houses in London were founded. This may mean that the individuals from these collections had very few burial options other than their local parish, despite any ability they may have had to pay for a more "prestigious" burial. Thirdly, given that wealth did not always equate with social status (Given, 1977: 68), lower status members of medieval London society may have been able to afford monastic burial while upper status members could not. Ultimately, the reason for these differences between the different cemetery types may be reflecting a disparity that we cannot fully appreciate by the limited information we have on who was buried within each cemetery.

8.4.1 ST MARY GRACES: A CASE STUDY OF DIFFERENCES IN SOCIAL STATUS

While social status is difficult to assess amongst the combined collections, the complications of which are highlighted above, a case study of the St Mary Graces collection (MIN86) provides a more concise way of interpreting violence in medieval London based on social status. Present on the St Mary Graces site were three distinct burial locations representing three distinct living populations: the intramural abbey burials, including high status members of the clergy and aristocracy (1353-1538); the abbey cemetery, which interred lower members of the clergy and aristocracy as well as upper/middling free men and women of the

City of London and servants of the abbey (1400-1538); and the western cemetery, which was used as a burial ground for victims of the later waves of the Black Death (1350-1400), and primarily interred individuals of lower and middling statuses (for a full description of the social status of the individuals from the MIN86 collection refer to Chapter 4). Thus, in this one site there exists a small but diverse sample of the medieval London population that makes it ideal for comparative analysis, and can succinctly express the dichotomy between skull and rib fractures noted above.

While there were no statistically significant differences in terms of overall fracture prevalence between the high status burials of the abbey precinct (both intra- and extramural) and the lower status burials of the western cemetery, there were significant differences in terms of trauma potentially caused by violence, specifically skull and rib fractures. This differentiation indicates that the social classes may have been equally prone to accidental injury but varied in their exposure to violence. This is similar to the patterns found in the other London collections noted above.

Males from the western cemetery were largely affected by skull trauma with 15.1% presenting with at least one skull fracture. This figure is extremely high compared with figures from other contemporary sites. At St Helen-on-the-Walls, Aldwark, 3.8% (13/ 338) of males presented with a skull fracture. And in the priory cemetery of St Andrew, Fishergate, another York cemetery, males had a 7.7% (17/220) crude prevalence of skull fractures (Dawes and Magilton, 1980: 56; Stroud and Kemp, 1993: 225-38). The rural village of Wharram Percy,

located in the Yorkshire wolds, had a slightly lower crude prevalence with 4.3% (9/211) of males presenting with skull fractures (Mays *et al*., 2007: 143-148). While St Helen-on-the-Walls and Wharram Percy interred individuals of relatively low status, these figures are more similar to the high status burials of St Mary Graces in which 3.7% of males were affected by skull fractures, than the lower status burials from the western cemetery. Based on these figures, it appears that the males buried in the western cemetery participated in, or were subject to, a significantly larger amount of violence than the general medieval population, either rural or urban.

Historical records also support the idea that lower status males were largely the victims and perpetrators of homicide in medieval London. In 91.6% (131/143) of full homicide inquests recorded in the Coroners' Rolls the victim was male and in all but three of those inquests the accused was also a male or a group of males (Chapter 3). In terms of social status, servants, apprentices, and skilled workers in London made up the vast majority of both victims and perpetrators. In contrast lords, knights, and royal and ecclesiastic officials only accounted for twelve victims recorded in the rolls. This is expected as high status individuals tended to have their underlings do their dirty work for them (Hanawalt, 1979: 139). While the Coroners' rolls only provide evidence from the 14th century, Given (1977) found a similar pattern in the eyre rolls and there is no other historical evidence to suggest that things may have been different during other points in the medieval period.

While social status may account for the difference seen between the abbey precinct and western cemetery burials, it does not explain why the western cemetery was more affected by skull trauma than other lower/middling status sites. It may be that the trauma within these other sites was underreported as violence was not the sole focus of these studies. Additionally, violence may have been more prevalent in London than in rural or other urban centres. It was (and is) the largest city in England, attracting migrants from the rest of the country as well as from abroad (Keene, 1984: 11-12). Such a large cultural melting pot would have likely caused a fair amount of friction, as highlighted in Chapter 2 with the xenophobic attacks on Jews and Flemmings. Drunken brawls also appear to have been a distinct quality of medieval London. As William Fitzstephen noted in the late 12th century (1772: 42-43): "The only two inconveniencies of London are, the excessive drinking of some foolish people, and the frequent fires".

In contrast to males from the western cemetery, males buried within the abbey walls presented with a high frequency of rib fractures. Over fifteen per cent were affected by at least one rib fracture, which was higher than either those buried in the abbey churchyard (7.7%) or those buried in the western cemetery (6.1%). This figure was comparable to the crude prevalence of males presenting with rib fractures in the Wharram Percy collection (11.8%: 25/211) and slightly higher than the crude prevalence of males from the priory cemetery of St Andrew, Fishergate (9.8%: 17/173; Mays *et al.*, 2007: 143-148; Stroud and Kemp, 1993: 261-274). It was much higher than the crude prevalence of males affected from the relatively low status site of St Helen-on-the-Walls (2.3%: 5/221; Dawes and

Magilton, 1980: 56). Accidental trauma as a result of rural life may account for the rib fractures from Wharram Percy, which most likely interred a large number of rural farmers, but it does not account for the rib fractures found in the intramural burials from St Mary Graces nor the possibly high status cemetery of the Priory of St Andrew, Fishergate.

Those buried within the abbey were among the most wealthy and powerful individuals in fourteenth- and fifteenth-century England. They were most likely not participating in backbreaking, rib-cracking labour. Why then do they present with such a high number of rib fractures? While the answer is not clear, it is possible to offer some conjectures. As only males are affected, the injuries were most likely the result of a male-dominated behaviour or practice. Males travelled much more frequently than females, and wealthy travellers were often at risk of attack from burglars and robbers. These attackers were often ruthless in their attempts to steal, and did not hesitate to injure or kill their victims (Hanawalt, 1979: 81-84). They also frequently targeted the king's highway in Essex and Surrey because of the large number of wealthy travellers going to London (ibid: 83). Historical accounts report that victims were often stabbed with knives or swords, shot with arrows, or beaten with fists (ibid: 81-90). It is conceivable that attacks such as these may have been the cause of at least some of the rib fractures. However, the scarcity of other injuries makes this seem unlikely. Additionally, as discussed above, women, particularly those of high status, did sometimes travel so if robberies were the cause of these rib fractures we might expect at least some females to have been affected by them.

It is also possible that these were battle-related injuries. But, as highlighted in Chapter 2, research into medieval war graves depicts a much different injury pattern, with the head being the main target (Cooper, 2010; Kjellström, 2005; Novak 2000: 91-95), at least in later medieval sites (Knüsel 2014: 270). While in many of these studies the individuals were not of very high status, the injuries found on the skeleton of Richard III and individuals buried in the Oslo cathedral suggest that those of high status were not exempt from serious injuries during battle or its aftermath, even with the apparent protection of armour (Appleby *et al.* 2014; Brødholt and Holck 2012). However, the above studies were focused on individuals who died in battle, and it could be that the rib fractures seen here are the result of non-fatal battle wounds. Another possibility for the discrepancy may be that poor skeletal preservation from the battlefield graves may have made perimortem rib fractures difficult to identify.

Perhaps, most likely, these injuries were sustained while practicing for combat. Knights and lords of medieval England trained for war from an early age and spent much of their time practicing or preparing for tournaments (Waller, 2000b). It is conceivable that these rib fractures were a result of this training, either from falling off of horses, getting jabbed in the chest with a lance whilst jousting, or getting hit with practice weapons. Modern data indicates that most rib fractures are the result of compression and/or direct blunt force trauma to the chest, and these activities would certainly include such behaviour (Brickley, 2005; Talhoffer, 2000). Direct historical evidence supporting this theory remains elusive, but modern studies have documented the phenomenon of "behind-armour blunt trauma" or BABT, in which the kinetic energy from a projectile or

other high-velocity weapon diffuses across armour (or in the case of the studies a bullet-proof vest) causing blunt force injuries (Mayorga *et al*., 2010; Prat *et al*., 2012). Rib fractures appear to be a particularly common resultant injury, with the location of fracture "often limited to the area in contact with the deformation [or weapon strike], but it can be associated with fractures or dislocations at a distance" as well (ibid).

8.5 CHRONOLOGICAL DIFFERENCES

The changing prevalence in violence over time proved to be difficult to measure. The different sites used in this research are dated to large periods of time that differ in length and often overlap. However, using different techniques, as outlined in Chapter 6, a few patterns emerged.

In breaking the collections up into an early period (11th and 12th centuries) and a late period (13th-16th centuries), the largest difference in fracture prevalence was between females. Females from the collections dated to the later time period presented with a greater percentage of bone fractures (26.0%: 25/91) than their counterparts from the earlier centuries (24.4%: 19/78). Additionally, while there was no difference between the sexes from the later time period, there was one between the sexes from the earlier time period, with females presenting with a significantly lower percentage of fractures than males. In fact, females from the early period had the lowest crude prevalence of trauma. A similar pattern was seen in relation to cranial vault fractures indicative of violence. While there was no significant difference between females from both time

periods, males from the early time period presented with a significantly higher percentage of fractures than the females from the early time period. Once again, there was no difference between the sexes from the later time period. These findings possibly suggest that females from the 11th and 12th century were less prone to injury, either accidental or intentional, than females from the later medieval period, and that there may have been a greater division in labour between the sexes during this time.

In order to explain this contrast between the females from both time periods, we need to understand how they differed. The two collections represented in the early period are St Nicholas Shambles and St Lawrence Jewry. They were both parish cemeteries founded before the Norman Conquest, meaning that their parishioners were probably later Saxons. Historians disagree on the status of Anglo-Saxon women, making for a difficult comparison of the early and later medieval periods. Power (1975) originally argued that Anglo-Saxon women, particularly those married to the church, enjoyed a large amount of power and independence that was then greatly diminished after the Norman Conquest and the establishment of firmer Christian ideals. This was most likely true of Anglo-Saxon nuns as their writings that have survived into the present day show a high level of education, equal to and in some cases surpassing Anglo-Saxon monks (Jewell, 1996: 46). The social status of Anglo-Saxon laywomen is a bit muddled. Certain aspects of Anglo-Saxon culture were beneficial to women, such as the ability to divorce as well as a greater importance placed on the male contribution to a marriage through a dower and a present given the morning after the wedding, called the *morgengifu*, over the female provided dowry (Fell, 1986;

Ward, 2006: 11). Despite this, women were often treated as property, and they did not have a large say in who they were to marry: it was a deal done between parents, and possibly the husband, to promote the property growth and wealth of their respective families (Jewell, 1996: 27-28). Additionally, against the best efforts put forth by the Church, the practice of Anglo-Saxon nobility having concubines, as well as wives, continued (Ross, 1985). Wives were seldom the only female in their husbands' lives.

The Norman Conquest signalled a great change in marriage and inheritance laws, and with it came a great change in the status of women. Legislation promoting monogamy and denying divorce first appeared during the late Anglo-Saxon period, but it was not fully successful until the establishment of the Gregorian reform in the 11th century (Ward, 2006: 11). These changes both promoted and prohibited the rights of women. While they could no longer divorce an abusive husband[63], Christian marriage dictated that both parties had to agree with the union before the wedding took place (Jewell, 1996). This meant that, at least theoretically, women were able to choose whom they wanted to marry. Parents still negotiated engagement contracts and strongly encouraged their children to follow through with them, especially amongst the wealthier families, but if either the husband or wife did not agree with their intended spouse they had the right to refuse. Additionally, the illegality of polygamy, although it could not, and did not stop extramarital affairs, insured that women had the full rights of a wife and did not have to worry about additional female competition (ibid).

[63] While divorce was not possible, the Church did allow for a couple to live separately from one another, if it was reported that either the husband or wife had committed adultery or were excessively abusive (Brundage, 2000).

While this does not make the picture any clearer, it is possible that one of these differences may have caused the disparity in fracture prevalence seen between the females from the two time periods. For instance, if later Saxon women were more easily able to leave an abusive husband, they may have been able to save themselves from injury. It is possible that this pattern is reflecting another difference between the collections found in each time period. As mentioned above, the early time period (1000-1200) is only comprised of two sites, St Nicholas Shambles (GPO75) and St Lawrence Jewry (GYE92), both of which were parish cemeteries from the northwest of the city. There is, however, a slight difference between the two in terms of social status. The parishioners of St Nicholas Shambles were mainly members of middling trades, such as butchery. While close in proximity, St Lawrence Jewry was in a more affluent area of London, near the Guildhall. Parishioners included members of guilds with a higher precedence, such as goldsmiths and ironmongers. As noted above in the section on social status, there was a marked difference between the sexes from the lay sites that was not mirrored in the monastic sites. This is a similar pattern to the one noted above, and it might be that either time, social status, or both are influencing this dichotomy.

Another chronological difference that was noted from the results was a peak in the true prevalence of violence-related injuries, specifically skull and rib fractures, amongst the St Mary Spital skeletons dated to 1250-1400. Since there was no difference in crude prevalence between the different time periods, we might argue that during this period a subset of the population experienced either

frequent violent assaults or experienced one particularly brutal assault that lead to several fractured bones. The reason for this increase may lie in the living conditions during the late 13th and 14th centuries.

While the 13th century was quite a prosperous period in medieval London, and indeed throughout the medieval world, this fortune was demolished in the 14th century (Herlihy, 1997: 39-40; Taylor and Childs, 1990: ix-xvi). Between 1315 and 1317 there were several periods of excessive famine, leading to widespread starvation, which may have killed between 10-15% of the English population. In 1348 the Black Death swept through England further decimated the population. The fact that the English were fighting deadly and expensive wars on two fronts (i.e. the Scottish Wars of Independence and the Hundred Years' War) further complicated matters. Ultimately, the combination of these events led to significant political, economic, and social instability (Herlihy, 1997: 39-40, 59-60; Taylor and Childs, 1990: ix-xvi), factors that have been shown to coincide with an increased prevalence of violence (Fox *et al.*, 2002; Samson and Groves, 1989). Thus, the peak in violence-related injuries seen amongst the St Mary Spital individuals dated to between 1250-1400 may have been due to this period of crisis.

Overall, the ability to analyse chronological changes was limited by the dating techniques used. Some of the collections from older excavations, such as St Nicholas Shambles (GPO75), have only been roughly dated using residual finds, giving us only a very large date range of two centuries or more. These broad date ranges hinder our ability to see more specific patterns in the data and

demonstrates how accurately dating excavated material through a combination of different techniques in the future, as was done with the St Mary Spital (SRP98) collection, is imperative for more detailed research.

8.6 PATTERNS OF WEAPONS-RELATED TRAUMA

An analysis of the pattern of injuries is useful in revealing characteristics of violence (Chapter 2), particularly information on the types of weapons used in assaults and the direction in which perpetrators attacked their victims (i.e. frontal vs. rear assault, etc.). In this study, while statistics were able to successfully analyse the overall prevalence of violence, they were unable to provide a very effective picture in terms of the pattern of weapons-related trauma, with most of the tests returning with a weak relationship. By addressing these issues with qualitative results, as outlined in Chapter 6, supported by the descriptive statistics in Chapter 7, we may be able to gain a better idea of how these injuries occurred, and what they may reveal about medieval violence. This section is broken down into types of trauma, focusing on blunt force, sharp force, and puncture trauma. Perimortem trauma is discussed separately, in the last section, as it may give us an idea of patterns of fatal assault and how it may have differed from non-fatal violence. As has been reiterated throughout this thesis, the following discussion only pertains to injuries that affected the skeleton. Many of the injuries medieval Londoners were victims of, whether accidental or violence-related, fatal or non-fatal, would have only affected the soft tissue.

8.6.1 BLUNT FORCE CRANIAL TRAUMA

Blunt force trauma was the most common type of skull trauma seen amongst the collections, with 1.5% (75/4882) of all individuals affected. This number rose to 10.9% (48/440) when the St Mary Spital collection was omitted. It was also the most prevalent form of weapon-related injury, representing 64% of the total. Individuals from every skeletal collection were affected, but the individuals from St Nicholas Shambles (GPO75) and St Mary Graces (MIN86), particularly those from the western cemetery, presented with a significantly greater number of blunt force injuries than expected. While collectively there was no difference between the sexes in terms of blunt force injuries, a significantly larger percentage of males from the St Mary Spital collection (2.2%: 37/1717) presented with depression fractures to the cranial vault than females from the same collection (0.9%: 14/1530). The lack of difference seen in the other collections may be due to the overall low numbers of individuals affected.

Statistical tests on the distribution of blunt force injuries in the London collections were inconclusive with both parietal bones and both sides of the frontal being about equally affected. However, while there were a number of lesions on the right parietal, the majority were on the left side of the bone (Figure 7.6). Still, the lack of predominance of injuries to the left hand side suggests that not all of these injuries were received from face-to-face combat. Instead, many of the assaults appear to have come from the rear and side (see Chapter 5 for methodology). In general, blunt force injuries are harder to attribute to a specific weapon than sharp force and puncture injuries, mainly due to the vast number of possibilities, but some studies have been successful

(Novak, 2000; Stirling, 2005: 107). Most of the depressed cranial fractures from the collections were relatively small in diameter with an average of 16mm ± 7.5mm, indicating that the weapons used to cause the injuries were likely small in diameter as well.

So what can we hypothesise from these blunt force injuries? Were they caused by collective violence, perhaps through battle or rioting, or were they caused by personal scuffles, either between neighbours or family members? What do they tell us about the structure of violence in medieval London? The wider historical and archaeological context laid out in Chapters 2 through 4 provides some evidence. In an interpersonal context, these forms of evidence support the preponderance of blunt force injuries in medieval London. The London Coroners' Rolls in particular seem to substantiate the patterning of injuries seen in the combined skeletal collections. All totalled, in 27.9% (39/140) of homicide inquests in the rolls a blunt force weapon was used by the perpetrator, and in 66.7% (26/39) of those inquests, the injury was to the head. The majority of these blunt force cranial traumas affected either the top or left side of the cranial vault, representing seven and ten inquests respectively. Regarding the injuries to the top of the head, the side is not attributed, and it is possible that some of these injuries affected the right parietal as well as the left. Overall, this was very similar to the pattern noted in the London collections highlighted above.

In terms of the prevalence of such injuries, studies on blunt force trauma in other medieval English towns are lacking. However, evidence from outside England indicates that it was a fairly common injury. In medieval Croatia, Šlaus *et al*.

(2012) found that blunt force injuries were the most prevalent form of craniofacial injury, representing 82.3% of all traumas. They also found that 12.0% (56/466) of all individuals presented with blunt force cranial vault trauma, which is higher than seen in the London collections. In the medieval Swedish town of Västerhus, the per cent affected was very similar to the London collections with 2.7% (10/371) of individuals affected by blunt force trauma (Kjellström, 2014: 242). Overall, these studies seem to indicate that blunt force cranial trauma was a common injury in medieval Europe, reinforcing the findings from the London collections.

In terms of the weapons used to cause these blunt force injuries, the most commonly cited weapon in the London Coroners' Rolls was a staff or stick in 22.9% (32/140) of inquests. After knives/daggers, it was the second most commonly cited weapon. Other weapons mentioned in the Rolls that might have caused blunt force injuries include sticks, measures of wood, shovels or oars, which were cited in a further five homicides. The frequency with which staves are mentioned in the Coroners' Rolls suggests that it was a fairly common item to carry on one's person, at least in the 14th century. The archaeological evidence reinforces this idea since staves are a common item found in medieval graves (Gilchrist and Sloane, 2005: 169-176). Four staves were found associated with individuals buried in the St Lawrence Jewry site (Bowsher *et al.*, 2007: 408), dated to between the 11th and 13th century, which has been suggested as evidence of having gone on a pilgrimage (Lubin, 1990). The dimensions of two of the staves were measured: one was 1.58m long and 60mm in diameter; the other was 0.55m long and only 6-8mm in diameter, which is perhaps too small and

flimsy to have caused much harm. More than twenty staves were also found in the burials of Sandwall Priory, in Staffordshire. The dimension of those staves varied from 1.35-1.96m long and 22-40mm in diameter (Hodder, 1991: 111-113). Overall, the narrow diameters of these staves further support the idea that similar items could have caused at least some of the injuries seen in the results.

Images from the period further suggest that staves would have been relatively small in diameter and thus may have been able to cause the small lesions found in the London collections. For instance, the 12th century (c.1130) illumination of the death of St Edmund in 869AD depicts two individuals striking Edmund with narrow staves (Figure 8.1). Although the event being depicted occurred well before the time period analysed in this study, the painting itself was made in the early 12th century, contemporary to many of the London collections, and may indicate that these were weapons with which the artist was familiar.

While there does not appear to be a large wealth of information regarding staff fighting, it seems to have been practiced at least by the 16th century when the famous fight between Robin Hood and Little John on a bridge with quarterstaffs was recorded in ballad form (Copland, 1565?). The benefits of staff fighting are also outlined in the 16th century fighting manual, *Paradoxes of Defence* (Silver, 1599, 1968: 38-39): "…the short staffe hath the vantage against the Battle-axe, blacke-bill, or Halbard: the short staffe hath the vantage by reason of the nimblenesse and length: he will strike and trust freely, and in better and swifter time then can the Battle-axe, Blacke-bill, or Halbard…". Silver (1599, 1968: 38)

even preferences striking the head over other parts of the body: “And here is to be noted, that if he fight well, the staffe-man never striketh but at the head…”.



Figure 8.1: “Life of St Edmund”: 12th century (*c.*1130) illumination of the death of Edmund the Martyr by the Danes, depicting the use of staves.

Between the London Coroners’ Rolls, illuminations, fight manuals, and the Robin Hood ballads, the combined evidence seems to secure the idea that staff weapons were used in both interpersonal brawls and more formal fighting from the 12th century through to the end of the medieval period. Evidence for such behaviour prior to this time is unfortunately lacking, which means that identifying staves as the cause of blunt force trauma found on skeletons from before this period (i.e. the earliest burial from St Nicholas Shambles and St Lawrence Jewry) is tenuous.

Personal weapons, such as fists and feet, may also be the cause of some of the depression fractures, as well as facial fractures, seen in the London collections.

However, historical evidence to support this idea is lacking since they were cited as weapons in only nine inquests (6.4%) from the London Coroners' Rolls with females being the main victims of such violence. This does not necessarily mean that medieval Londoners did not get into fistfights. It mainly indicates that the sole use of personal weapons was unlikely to be fatal. Fenton *et al.* (2003) outline a modern instance in which a fist caused a fatal blunt force trauma to the cranial vault. However, the size of the lesion is much larger than all but one of the blunt force injuries seen in the London collections, perhaps suggesting that while punches may have been to blame for some of the facial trauma it is unlikely to have caused many of the cranial vault depression fractures seen here.

Blunt force trauma can also be battle-related, although the trauma recorded from the medieval battlefield sites highlighted in Chapter 2 indicate that it may have been relatively rare. At the Battle of Towton, 25% of all cranial trauma, and 14% of the post-cranial trauma, was attributed to a blunt force weapon (Novak, 2000: 93, 95). They were likely resultant from a mixture of fighting techniques and not just face-to-face combat: 46.4% (13/28) of blunt force injuries came from an anterior direction, 28.6% (8/28) came from a posterior direction, and 25% (7/28) came from a lateral direction (Novak, 2000: 95). At the Battle of Wisby site only four individuals were identified as presenting with blunt force trauma[64], all to the cranium (Inglemark, 1939). And, at the cemeteries of St Andrew, Fishergate, which interred a large number of individuals presenting

[64] Although this may be due to the fact that credible methods for identifying perimortem blunt force trauma were not yet discovered at the time of analysis. As noted by Inglemark (1939: 191): "Injuries from [a mace] are extremely difficult to identify, because they generally completely crushed the bone or cranium, an injury, which cannot possibly be distinguished from the damage done to the skeletons while they were lying in the grave".

with battle-related trauma, only one individual presented with a depressed fracture to the skull, which was fully-healed and thus did not occur at the same time as the perimortem weapons-trauma attributed to war (Stroud and Kemp, 1993: 231). No blunt force injuries were reported at all from the Battle of Good Friday (Kjellström, 2005).

During battles, a number of weapons could be used to cause blunt force trauma, although they are likely to have caused a depression fracture much larger than 16mm in diameter (Novak, 2000: Figure 8.6a and b, p. 97). The mace was a common weapon used in warfare after the implementation of plated armour as a way of crushing it to impair movement (Rimer, 2000: 128). Talhoffer's and Fiore's 15th century fighting manuals demonstrate that the pommel of swords may also have been used to strike one's opponent (Figure 8.2). Inglemark (1939: 160) states that morning stars (a spiked ball attached to a wooden handle by a chain) as well as war-hammers were probably used at the Battle of Wisby (1361), but does not link any observed trauma with these weapons. No blunt force battle-related trauma has ever been linked to staves[65], punches or kicks, but that does not mean that it did not occur. However, it may have been an ill-advised fighting technique when going up against more effective weapons such as swords.

[65] Sharp force trauma has been linked to staff weapons with a blade attached, such as a halberd (Cooper, 2010; Waldman, 2005).

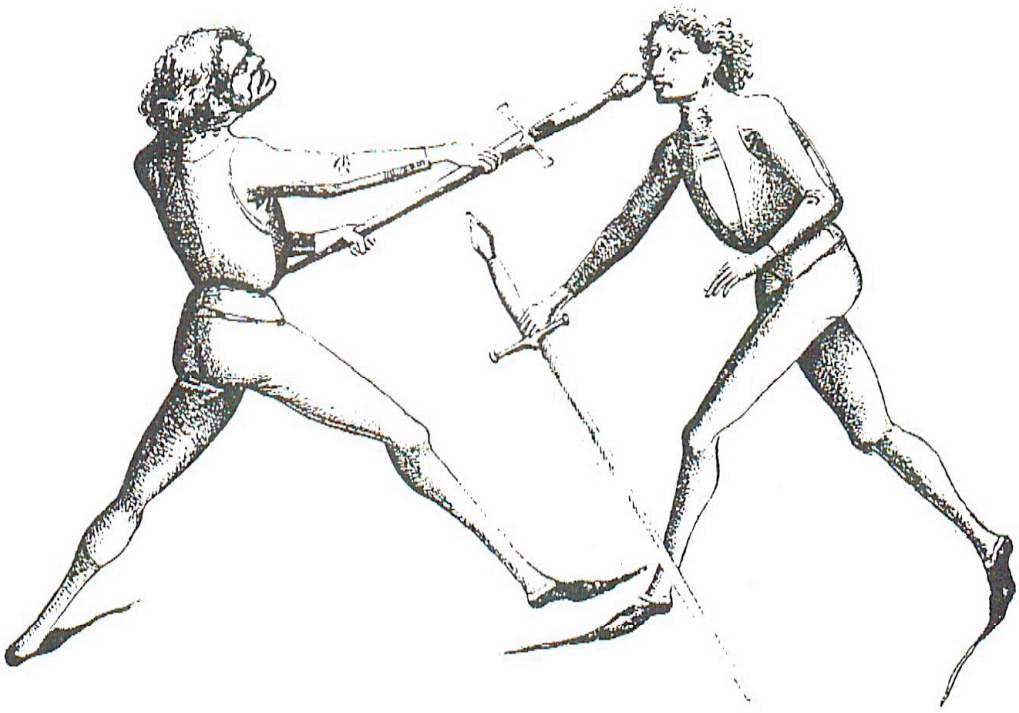


Figure 8.2: Evidence for the use of the sword as a blunt force weapon.

Consequently, while battle-related blunt force trauma is certainly possible, the injuries that result from the use of a sword pommel, warhammer, or mace would usually be far larger, and cause much greater damage than the majority of blunt force injuries seen in the London collections. It may then be argued that the majority of blunt force trauma seen in these collections is most likely due to weapons common to interpersonal or small group violence, such as staves or fists.

Accidental injury may also be to blame for these blunt force injuries. While all of the lesions met the criteria (Chapter 5) for being identified as at least consistent with violence (i.e. larger than 5mm, above the hat brim line, and possibly associated with other violence-related trauma such as facial fractures), with blunt force trauma there is always the possibility that it was caused by falling onto a blunt object or having a blunt object fall on one's head. There is at least

one instance of this recorded in the London Coroners' Rolls: On 11 November 1300, "it happened by accident that a certain piece of wood for a long time past fastened to a solar…for the purpose of drying saddles, fell upon his head, inflicting a wound four inches long and two deep" (Sharpe, 1913: 4). While this injury, at approximately 100mm, was quite a bit larger than the average blunt force lesion from the collections, other falling objects may have caused smaller wounds. In particular, individuals from St Nicholas Shambles, St Lawrence Jewry, and perhaps London Blackfriars as well, would have held occupations that may have caused blunt force injuries. For instance, as outlined in Chapter 4, live animals have been known to kick butchers, frequently fracturing their ribs and sometimes their skulls, although if the skull is affected it appears to most often fracture the mandible (Mohammadzadeh *et al.*, 2013; Zhang *et al.*, 2012). Additionally, metalworkers and other labour-intensive craftsmen, who are likely to have been buried in the St Lawrence Jewry cemetery, may have been injured through the daily use of large, heavy tools. Although an assessment of their risk in Chapter 4 suggests that the extremities are the most likely location of injury (Saha *et al.*, 2007).

To summarise, in his analysis of trauma identified in the St Mary Spital collection (SRP98), Walker (2012: 181) suggests that the prevalence of blunt force injures over sharp force ones may "reflect a society where the more typical form of violent assault resulted in blunt force rather than sharp force injury". Although the London Coroners' Rolls suggest that sharp force injuries were more common than blunt force ones, it may be that blunt force trauma is less likely to be fatal, and thus is missing from the Rolls. Osteological studies from other areas of the

medieval world support the notion that blunt force injuries were common (Šlaus *et al*., 2012; Kjellström, 2014). Additionally, while it is possible that some of the observed injuries from the London collections were the result of battles/skirmishes or occupational accidents, it is perhaps more likely that they were the result of interpersonal violence caused by either staff weapons or punches/kicks. Overall, more studies on attritional cemeteries that analyse blunt force trauma, like this one, Šlaus *et al*.'s (2012), and Kjellström's (2014), need to be carried out to see if this potential pattern was common across medieval England and Europe, perhaps further cementing the cause and effect of such injuries.

8.6.2 SHARP FORCE TRAUMA

Thirty-five individuals from the combined collections presented with sharp force trauma, representing 0.6% (35/6164) of the analysed population. Individuals from four collections were represented (St Nicholas Shambles, St Lawrence Jewry, St Mary Spital, and St Mary Graces) and both males and females were affected, although males slightly more so. Sharp force trauma accounted for roughly a third (31.5%: 35/111) of all weapons-related injuries in the collection and the majority affected the cranial vault with only one individual presenting with sharp-force trauma to the post-cranial skeleton (MIN86: 16052; discussed further in section 8.8.4.2).

In Chapter 6 it was shown that long-bladed weapons appear to have been the cause of at least five of the injuries seen in these individuals. One male from St

Nicholas Shambles (5047; Figure 6.4) and one male from the western cemetery of St Mary Graces (9810; Figure 6.26) displayed injuries most likely caused by a sword. Another male from St Nicholas Shambles (5237; Figure 6.5a) presented with sharp force trauma that may have been caused by either a sword or an axe. An axe was further implicated in two more injuries, one a male from St Lawrence Jewry (20105; Figure 6.14) and the other from the western cemetery of St Mary Graces – although a piercing sword/knife may have also been to blame (12525; see Chapter 6 for full descriptions). One sharp force injury, on a male from the abbey burials of St Mary Graces (13622), was unable to be attributed to a specific weapon. As the skeletons from St Mary Spital (SRP98) were unable to be physically examined and no images were provided, they are not included in this qualitative discussion.

It should be noted, that in all instances of sharp force trauma the injuries were only assessed as highly consistent with or typical of violence. As such, the possibility for accidental injury with a bladed weapon always remains. This possibility is highlighted by the London Coroners' Rolls in which, on 8 September, 1337, "William Russel and John Paul…were engaged in a friendly game when the said William Russel fell over the said John Paul and in his fall, the point of the knife of the said John pierced the belly of the said William near the navel" (Sharpe, 1913: 196). While this particular injury is likely to only have affected the soft tissue, similar events could have caused at least some of the observed trauma.

Specifically, in Chapter 4, it was shown that many of the individuals from St Nicholas Shambles (GPO75) may have been butchers and this could have predisposed them to sharp force injuries. However, as was also highlighted in that section, butchery injuries were predominately caused by sharp animal bones, which are more likely to cause soft tissue lacerations or puncture trauma, or by live animals kicking or stampeding, which most likely lead to fractured bones or blunt force trauma (Omokhodion and Adebayo, 2013). When knifes or other bladed butchery tools do cause injury they seem to mainly affect the extremities (Barnham and Kerby, 1981). The same is likely to be true of many accidental blade injuries. As the majority[66] of the sharp force injuries seen in the St Nicholas Shambles site, or indeed in any site, affected the cranial vault accidental occupational injury may have been relatively unlikely.

In an interpersonal context, the London Coroners' Rolls demonstrate that sharp force trauma may have been common, with the vast majority (74.3%: 104/140) of inquiries citing a bladed weapon as the cause of death. Unfortunately, the rolls do not discriminate between cut and puncture wounds, so the type of wound these injuries created is uncertain, although it was probably a mixture of the two. Sharp force trauma has also been noted in a small number of archaeological sites from other regions of medieval England, but most have been attributed to some sort of collective violence, which is discussed further below.

Regarding the weapons that may have been used to cause the sharp force injuries observed in the London collections, swords have sometimes been

[66] All but one, individual 16052 from the intramural burials of St Mary Graces.

implicated in interpersonal violence, although they were found in only 12.9% (18/140) of all homicide inquiries recorded in the London Coroners' Rolls. Axes were commonly used during battle, as will be discussed below, but they were also commonly used as a tool and there is a precedent for their use in homicide. In the London Coroners' Rolls, axes were cited four times, representing 2.9% (4/140) of all recorded inquests. In two of the inquiries the weapon was specifically described as a poleaxe, and in three out of the four inquests the injury was to the skull. Thus, it is possible that the injuries that were likely caused by swords or axes were due to interpersonal violence.

Perhaps the most commonly used weapon in instances of interpersonal violence was the knife/dagger. It was the most cited weapon in the London Coroners' Rolls, found in 55.7% (78/140) of all homicide inquests. This is perhaps unsurprising since, as highlighted in Chapter 3, all medieval Londoners, even women and children, frequently carried knives on their person to be used as an eating utensil or tool (Hanawalt, 1993: 75; Rimer, 2000: 122). However, despite its apparent prevalence, no sharp force trauma from the collections could be definitely linked with a knife. Whether this discrepancy is because cut marks from knives were unlikely to affect the bone, or because there simply was not a lot of knife violence present in medieval London is unclear. Interestingly, knives were implicated in puncture/piercing trauma (discussed further below), which may indicate that the former explanation is the most probable.

In terms of collective violence, sharp force injuries appear to have been the most common form of trauma. At the Battle of Towton (1461) most (65%: 73/113) of

the observed injuries were sharp force and the same was true for the Battle of Wisby, the Battle of Good Friday, and the Battle of Dornach (Cooper, 2010; Inglemark, 1939; Kjellström, 2005; Novak, 2000: 93-96). In the skeletons from the royal church of St Mary in medieval Oslo, the injuries of which have been attributed to warfare, sharp force trauma was found in 33.2% (82/247) of the crania; the only other type of weapons-related injury observed was puncture trauma (Brødholt and Holck, 2012). Perimortem weapons-related trauma was also found in a large number of males from the cemeteries at St Andrew, Fishergate (Stroud and Kemp, 1993: 238). From the earlier lay cemetery (late 10th-12th century), 55.9% of males presented with a sharp force injury, and 18.2% from the later abbey cemetery (1195 to late 16th century; ibid: 171, 238). Apart from warfare injuries, bladed weapons were also often implicated in attacks by robbers and highwaymen (Hanawalt, 1979: 81-90) as well as during large riots such as the Peasants' Revolt (Spindler 2012: 61).

Concerning the location of injuries, the sharp force trauma observed on the skeletons from the Battle of Towton predominately affected the skull. Seventy-three injuries affected the crania, with the majority delivered from either the front or the rear of the victim: 35.6% and 31.5% respectively (Novak, 2000: 95-96). A much smaller number of sharp force injuries (37) occurred to the post-cranial skeleton, and mainly occurred to the forearms, with a few affecting the lower limbs, buttocks, neck, and shoulders (ibid: 93). A similar pattern is seen in St Mary, Oslo, the Battle of Good Friday, and the Battle of Dornach (Brødholt and Holck, 2012; Cooper, 2010; Kjellström, 2005).

Apart from Towton, Oslo, and Good Friday, other evidence suggests that sharp force trauma predominately affected the post-cranial body. In the London Coroners' Rolls the majority of the injuries appear to have been to the body of the individual with only 21.2% (22/104) of injuries from bladed weapons occurring to the head. At the Battle of Wisby, the post-cranial skeleton, particularly the tibia, was affected more than the crania (Inglemark, 1939: 175). At St Andrew, Fishergate all but two of the 29 males were affected by sharp force trauma to the post-cranial skeleton, while the skull was only affected in 16 individuals (Stroud and Kemp, 1993: 238). Combining the results from these studies, Knüsel (2014) argues that the location of weapons-related trauma is time period dependent, with the post-cranial skeleton being favoured in warfare during the earlier centuries (11th-14th century) and the skull in later ones (15th-16th century). But, this theory is not supported by the sampling of data in this thesis, where a higher proportion of skulls from the earlier time periods (11th and 12th centuries; 2.3%: 4/143) were affected by sharp force injuries than in the later time periods (13th-16th centuries; 0.6%: 30/4739). The difference is statistically significant, but with a weak relationship (Fisher's Exact Test: $p = 0.02$; $\Phi_c = 0.04$). Whether this means that Knüsel's theory is not absolute or that these individuals received their injuries outside of organised warfare is uncertain.

While, as noted above, swords were sometimes used in an interpersonal context, they may be more commonly attributed to battle-related sharp force trauma. The type of weapons used to cause sharp force trauma observed on individuals from the Battle of Towton and the Battle of Good Friday were not attributed, but

Rimer (2000) suggests that swords were the bladed weapons of choice in battle during this period. At the Battle of Dornach, both archaeological and forensic evidence has shown that halberds were perhaps the most likely weapons to have caused the observed injuries, and this was in keeping with the popularity of the weapon in Germany during this time (Cooper, 2010; Waldman, 2005: 100-102). Axes were also popular battle weapons, particularly in the early to high medieval period and especially with the Vikings and Anglo-Saxons (DeVries, 1992:17). As one of the individuals from the London collections with a potential axe injury (GYE92: 20105) is dated to 1050-1140 it is possible that this was a battle-related injury. Knives were also carried onto the battlefield, but they were usually reserved for worse case scenarios in which all other weapons had been lost (Rimer, 2000: 122). Other bladed cutting weapons common to the medieval period, but which have not been directly linked to sharp force trauma in the skeletal record, include the bill (used mainly by the infantry) and the glaive (a long broad blade attached to a long staff; Rimer, 2000: 125).

Based on this evidence, it may be argued that, in general, long-bladed weapons were more likely to have been used on the battlefield, whereas knives were more commonly used during individual or small group disputes. Still this difference is not absolute, and the sharp force injuries observed amongst the London collections may have been caused by warfare, attacks from robbers/highwaymen and rioters, or by interpersonal violence.

8.6.3 PUNCTURE TRAUMA

Nine individuals from the London collections presented with puncture trauma: three from St Nicholas Shambles (5096, 5141, and 5201: all male) one from St Lawrence Jewry (20574: a female), two from St Mary Spital (22087 and 26580: both male), and three from St Mary Graces (11005, 6272, and 7367: one male and two females, all from the western cemetery). Seven of the injuries affected the cranial vault, one affected a rib (5141), and the last affected a fibula (7367). In terms of the cranial injuries, three of the injuries occurred from a posterior direction, while the directionality of the other six is uncertain, but possibly posteriorly or laterally. Five of the injuries were perimortem and the last four were almost completely healed. The type of weapon used was often difficult to determine, but arrowheads, knives/daggers, or other bladed weapons are the most probable (see Chapter 6). Overall, the skeletal evidence would suggest that puncture trauma was the least common violence-related injury, and the historical record would support this theory. However, it should be noted that as puncture trauma is likely to affect a smaller area of the body compared to blunt or sharp force trauma, it may be even more likely to have only affected the soft tissue. Same as in the above sections, accidental injury always remains an alternative explanation for these injuries.

In an interpersonal context, projectile weapons were only cited in three inquiries from the London Coroners' Rolls and in none of these instances was the skull the location of the injury. Piercing trauma from bladed weapons was hard to discern since cutting versus stabbing wounds were not differentiated, so some puncture trauma injuries are unable to be identified. Arrows were the only weapon

mentioned in the London Coroners' Rolls that would have definitely caused puncture trauma, but they were only cited in three instances, representing 2.1% of all homicide inquests. No spears were recorded in the rolls, which is likely due to the fact that they went out of fashion during the 13th century (Swanton, 2003), but it is possible that they were used in either an interpersonal or battle context in earlier centuries of the medieval period. Additionally, a poleaxe was cited in two inquests and while the description does not detail which part of the poleaxe was used, it is possible that the top spike of the weapon may have been used either instead of or in conjunction with the blade.

As mentioned above, the London Coroners' Rolls do not provide details on piercing injuries from bladed weapons. But, knives could be used to stab just as easily as they can be used to cut, and they were the most common weapons used in homicide in medieval London, cited in 55.7% (78/140) of all inquests. This combined evidence indicates that they may be implicated in certain puncture traumas. The blades of many medieval knives came in a variety of shapes and sizes. Not all blades were flat, with diamond and triangular shaped blades also being popular. These more unusually shaped blades would have produced puncture trauma of a similar shape (Novak, 2000). For instance, a rondel dagger may have produced circular puncture trauma and hence may have been the cause of some of the more rounded injuries seen in the London collections. However, the pattern of knife trauma in the rolls shows that the head was not commonly targeted as it was only cited as the location of a knife wound in 11.9% of inquests. Since all rounded puncture traumas were located on the cranial vault, this may argue against rondel daggers being used in every case.

Swords can also cause a puncture type trauma if they are used to thrust, instead of to cut. However, it was only possible to use the sword to thrust towards the end of the 14th century with the development of sharp, pointed ends (Rimer, 2000: 120). Before, swords had a rounded point (ibid). While the Coroner's Rolls do not provide information on how the sword was wielded, post-14th century skeletal evidence from the battlefield of Towton and attritional cemeteries of St Andrew, Fishergate as well as literary evidence suggests that the sword was predominately used as a cutting weapon, instead of a thrusting weapon (Novak, 2000; Stroud and Kemp, 1993; Davidson, 1994: 196). Despite this evidence, the images found in Fiore's fighting manual show that, that at least after the 14th century, using the sword to stab was not unheard of (Figure 8.3).

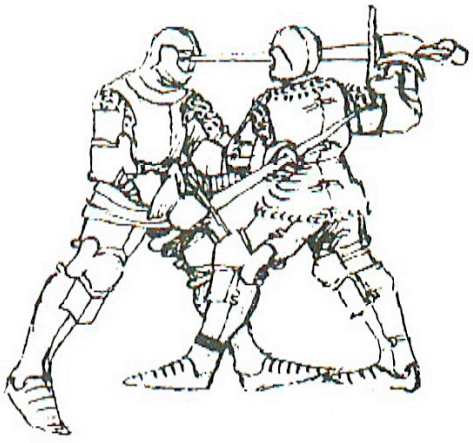


Figure 8.3: Evidence of a sword being used to thrust, instead of cut.

Most of the evidence of puncture trauma from the medieval period comes from battlefield mass graves. Twelve separate puncture wounds were found in eight individuals from the Battle of Towton (Nowak, 2000: 97). In matching the lesions size and shape to weapons that were used in the battle, they were able to identify which weapon was mostly likely used to cause each type of puncture trauma.

They found that a mix of blunt, sharp, and projectile forces were the cause. Likely weapons included bodkin-type arrowheads, crossbow bolts, top spikes of poleaxes, the beaks of war-hammers, and bladed weapons such as swords (ibid). The puncture trauma from the medieval battle site of Wisby, Sweden, is attributed to arrowheads, lances, and morning-stars, a spiked ball attached by a chain to a wooden handle; it predominately affected the crania with only two puncture wounds found on the postcranial skeleton (Ingelmark, 1939: 160, 187). The directionality of puncture wounds from this site suggests that attacks came from all sides, not just from a frontal assault (ibid: 191). An individual from the Tudor ship, the Mary Rose, also presented with a rounded puncture trauma, with no comminuted or radiating fractures, and that is suggested to have been caused by a bodkin arrowhead (Stirling, 2005: 107). It is similar in size and shape to three of the traumas identified in the London collections, particularly individual 5201 (a male, aged 26-35) from the St Nicholas Shambles cemetery.

Without knowing exactly when and where the individuals from the London collections were injured, it is difficult to know what types of weapons they were likely to encounter. The individuals from St Mary Graces would have lived less than a hundred years before the Battle of Towton, and were contemporary to the Battle of Wisby. As some of the injuries found in these two sites are similar to one of the males from St Mary Graces with puncture trauma (11005 from the western cemetery), it is possible that he was injured by any of the weapons mentioned above. In particular, there is a similar shaped wound found on individual 40 from Towton. It was determined that, in this individual, an armour-

piercing arrowhead caused the oval-shaped lesion to the left side of the occipital (Novak, 2000: 98).

Conversely, the individuals from St Nicholas Shambles and St Lawrence Jewry would have lived sometime during the 11th and 12th centuries. As such, they were unlikely to have been injured by a poleax or war hammer since they were inventions of the later medieval period, around the 15th century (Waldman, 2005: 155, 161). Arrowheads and lances, while slightly different in the later medieval period when the battles of Towton and Wisby occurred, were common weapons in the 11th and 12th centuries and, and could have caused the injuries seen in the individuals from these sites. It is also possible that a spear caused some of the injuries, since it was a popular weapon during those centuries. While the tip of many medieval spears was flat and leaf-shaped, there were some spears, like the angular or corrugated spears, which were more lozengiform or helicoidal in shape (Swanton, 1973: 77, 115), and would have created more rounded injuries such as those seen in individuals 5201 (Figure 6.8) and 5096 (Figure 6.6) from St Nicholas Shambles.

Overall, the varying types of puncture trauma seen in the London collections may have been due to both interpersonal as well as collective violence and may have been caused by a variety of weapons including knives/daggers, arrowheads, and spears.

8.6.4 PERIMORTEM TRAUMA

While much of the perimortem trauma seen in the London collections was included in the above sections on weapons-related trauma, it is addressed separately here to give an idea of fatal patterns of assault. Twelve individuals from the combined collections presented with perimortem trauma, representing 0.2% (12/6164) of the skeletal population. If the St Mary Spital (SRP98) collection is omitted, the prevalence rises to 1.2% (9/764). It should of course be noted, that the cause of death cannot necessarily by identified for various reason (see Chapters 2 and 5 for reasoning), but it may be hypothesised that the injury likely contributed to death.

Nine males from the collections presented with perimortem trauma, representing 0.4% (9/2483) of the total male population. Five were from St Nicholas Shambles (GPO75), three were from St Mary Graces (MIN86), and one was from St Mary Spital (SRP98). All injuries were at least consistent with violence, but of course accidental injury cannot be fully ruled out. No unusual burial contexts were noted, including any grave goods. Seven of the injuries affected the skull, primarily the cranial vault, and appear to have been caused by a mixture of sharp force and puncture trauma with swords, arrowheads, and knives/daggers being the most likely; and in one case (discussed further below in section 8.8.4.1) a blunt force weapon, possibly fists or feet. Another of the individuals had a puncture trauma to left middle rib (GPO75: 5141) most likely caused by a knife or dagger. The last case was sharp force trauma to the C5 vertebra possibly indicative of a decapitation (discussed further in section 8.8.4.2).

There were only three females from the collections that presented with perimortem trauma consistent with violence, representing 0.1% (3/2058) of the total female population. Two were from the St Mary Spital (SRP98) collection and the other was from the western cemetery of St Mary Graces (MIN86). One of the women from St Mary Spital (3243) presented with an unhealed depression fracture to the bregma and the other (15586) presented with a sharp force injury to the right parietal. Both women were dated to the 1200-1250 period. The woman from St Mary Graces (7367; dated to between 1350-1400) presented with a puncture lesion to her right fibula, most likely caused by either a knife or sword. No unusual burial contexts were noted.

With such a small number affected, it is hard to distinguish the prevalence or patterns of female homicide in medieval London, other than to suggest that it was a rare occurrence, but perhaps not as rare as the historical records indicate. The medieval London Coroners' Rolls, all from the first half of the 14th century, certainly show that women were rarely the victims of homicide. They represented only 7.7% (11/140) of all homicide inquests recorded over the seven non-continuous years of extant data. While this is a small sample, more complete rolls from elsewhere in England tell a similar story with women rarely involved in homicide or other violent encounters (Hanawalt, 1979; Butler, 2001).

Overall, the larger number of bladed weapons implicated in these injuries may suggest that sharp force/puncture injuries were more likely to be fatal than blunt force injuries. This was a pattern that was suggested above based on the

fact that there were a high number of homicides using bladed weapons in the London Coroners', but a lower number of sharp force/puncture injuries compared with blunt force trauma found in the collections. Of course, this theory is based off of a small sample size and more data from other medieval skeletons would be needed to confirm this.

8.6.4.1 HOMICIDE AND THE BLACK DEATH

There were three individuals with perimortem VRI buried in the western cemetery of St Mary Graces (MIN86). The first was a male aged 36-45 (8102; Figure 6.25), who presented with perimortem trauma most likely caused by blunt force trauma. He presented with perimortem fractures to the right zygomatic, left zygomatic arch, and right nasal. He also had a diastatic fracture to the left occipitomastoid suture. His injuries are indicative of several blunt force strikes to the face, which are often the result of punches or kicks (Guyomarc'h *et al.*, 2010; Scherer *et al.*, 1989). While such behaviour may have taken place during battles, the lack of other injuries, particularly sharp force trauma, which seems to define battle injuries (see above), may make this an unlikely explanation.

The second individual was also a male aged 36-45 (11005; Figure 6.27), who presented with an antemortem depression fracture as well as a perimortem puncture trauma, both to the left parietal. It was suggested, both in Chapter 6 as well as above, that the lozengiform shape of the lesion might have been caused by a bodkin arrowhead or a rondel dagger. The similarity in shape to a trauma found at the Battle of Towton may indicate the former. The last individual was a

female of unknown age (7367; Figure 6.31) with perimortem puncture trauma to the right fibula. The slit-like injury is most consistent with either a knife/dagger or sword. No unusual burial contexts were associated with any of these individuals.

It is interesting that there were individuals with perimortem trauma buried in a supposed late plague cemetery. Why were people who apparently died from violent assault buried in a Black Death cemetery? There are no historical data available to answer this question definitively. Quite possibly these individuals may have experienced a violent encounter, and then succumbed to plague before any healing of their injuries could have occurred. Conversely, while a violent encounter may have caused their death, they may also have had the Black Death, which could have warranted their burial in a plague cemetery.

It is possible, however, that these individuals were not victims of the Black Death at all. The western cemetery could have also been used as a convenient burial place for those who had no money or family to give them a proper burial. This theory is supported by the fact that one of the individuals, the one with blunt force injuries (8102), appears to be of sub-Saharan African ancestry[67]. As there is no record of any individuals of African descent living in London during this time, it is possible that he had no relations present in London to care for his body or, that as an unknown alien, he was barred from being buried in a proper cemetery (Bolton, 1998; Daniell, 1997: 104). Additionally, open graves in a relatively

[67] This was assessed by the morphology of the cranium. If correct, this could be an incredibly significant discovery since evidence for sub-Saharan African migration to England during this time (1350-1400) is non-existent.

isolated location may have been an attractive location for the clandestine burial of murder victims.

8.6.4.2 AN EXECUTION VICTIM?

One individual from the London collections presented with perimortem trauma that indicates he may have been the victim of an execution. The individual was buried in the St Mary Graces (MIN86) abbey and presented with sharp force trauma to the C5 vertebra. The cut was an inferior transverse fracture delivered from the posterior, suggestive of an attempted decapitation. The cut was not full thickness and had some minor spalling, indicating that there may have been multiple blows. Neither the C1-4 vertebrae nor the skull were discovered in the grave, and there is no evidence to suggest that it was ever present. This may suggest that head was completely removed from the body and perhaps not buried with it. Other than the lack of a head, there was nothing else unusual about the burial context, at least as noted in the site report.

The individual was buried in the presbytery of the church of St Mary Graces, quite near where the altar would have been located. He, therefore, must have been a man of some repute to be buried in such a coveted, and expensive, location. It is known from both archaeological finds and historical data that executed members of the aristocracy, despite their indiscretions, were often still buried in prestigious locations (see Chapter 3). It is also known that Sir Simon Burley, friend and advisor to Richard II, was taken to St Mary Graces Abbey after he was beheaded at the Tower of London for treason on 5 May 1388 (Higden, 1886: 177; Lewis, 1937: 668-9). While the exact location of Burley's body is

unknown, no other execution victim is known to have been buried in the abbey, and his wealth and status would certainly have been able to afford him such a prestigious burial location. This combined evidence makes a convincing argument that this individual with the decapitation-like injury is indeed he.

8.6.5 ST NICHOLAS SHAMBLES: A CASE STUDY OF POSSIBLE PERIMORTEM BATTLE TRAUMA

There were five individuals from the St Nicholas Shambles (GPO75) collection (11th-12th century) that presented with perimortem trauma. All of the individuals were adult males. Four of the individuals presented with perimortem trauma to the cranial vault while the other presented with perimortem trauma to a left middle rib. Unfortunately, the site report shows the exact burial location of only one of the individuals with perimortem trauma so no further information was able to be gleaned by the individuals' burial positions in relation to one another. Stratigraphy also does not provide any further evidence, as it was only broadly used to fix the date of the cemetery to between the 11th and 12th centuries.

These injuries are discussed at length both in the St Nicholas Shambles section in Chapter 6 and in the above section on weapons-related trauma, but to provide an overview: Two individuals presented with low-velocity puncture trauma (one of the individuals also presented with two blunt force lesions); another two individuals presented with sharp force trauma from long-bladed weapons; and the last presented with a piercing wound from a small, narrow blade, possibly a knife. Overall, the injuries suggest a wide range of weapons: from long-bladed

weapons such as swords and axes, to shorter-bladed knives, to blunt weapons such as hammers or clubs, to penetrating weapons such as spears, poleaxes or arrowheads. These were weapons commonly used in battle, but as we saw above they could also be implicated in interpersonal homicide.

Excepting the individual with the possible knife wound to the left rib, all of the trauma was concentrated around the cranial vault. This is a pattern seen in other skeletons from medieval battles sites (i.e. the Battles of Towton, Good Friday, and Dornach mentioned above). However, almost a complete lack of post-cranial injuries is rare, particularly from such an early medieval site (Inglemark, 1939; Knüsel, 2014; Stroud and Kemp, 1993). Many of these individuals from battlefield sites also presented with multiple perimortem injuries; for instance, at Towton there was an average of 4.2 cranial injuries per individual (Novak, 2000: 95). While individual 5201 had at least 3 cranial injuries, the other individuals do not present with multiple injuries, perhaps precluding a secure link with battle-trauma.

Of the six separate perimortem injuries discovered on the crania of the individuals from St Nicholas Shambles, two were inflicted from behind the victim, two from the sides (one from the left and the other from the right), and two from the front. This pattern suggests that, apart from individual 5201 who presented with two perimortem blunt force injuries to the frontal bone, the rest of these individuals were most likely not caused by organised face-to-face combat. Kjellström (2005) found similar patterns amongst the individuals from the Battle Good Friday, with many of the injuries discovered in these skeletons

located on the posterior and sides of the skull as well as to the anterior. She tenuously proposes that this injury pattern may be due to being struck while in the midst of retreat. Taken together with the weapon-type and number of injuries, it is possible, but not definitive, that these injuries were caused by some type of battle or skirmish and perhaps whilst they were in the midst of retreating.

Medieval burial rituals for victims of battle are not fully known. Certainly, some of the victims were buried in large pits on site, particularly those of middling to lower status as those buried in the St Nicholas Shambles cemetery most likely were (i.e. Towton battle site). If the victims were moved, it may have only been to a church or cemetery relatively close to the battle site, as seen with the body of Richard III, which was taken from the Battle of Bosworth Field to the Greyfriars church in Leicester. Usually, only those of high status would be carried further for burial, although even then sometimes only parts of their body, such as the heart, were returned if the individual died a very long distance from home (Golding, 1985; Westerhof, 2008: 58, 82-86). Therefore, if these individuals were killed in a battle, it is likely that the battle took place in or around the City of London.

This site has only been crudely dated using stratigraphy, pottery, and other small finds. As such, the cemetery is dated to between 1000-1200. There were a fair amount of recorded battles or skirmishes in and around London during this time. Before the Norman Conquest, during the late 10th and early 11th centuries, the Vikings commonly invaded and conquered London (*London and the Vikings,*

1927: 13-16; Brooke and Keir, 1975: 21-26). Specifically, in 980 the Vikings sacked and burned the city, and between the years 1009 and 1014, London was continually assaulted by the Danes (ibid). However, the most prominent violent event during this period were the battles leading up to William the Conqueror's coronation in London following the Battle of Hastings. During this time, William's armies attacked London twice. The first time was from the south, where they were met and defeated by the English army at Southwark (Stenton, 1971: 596). Unable to cross the Thames using London Bridge, William moved west to cross at Wallingford instead (ibid). From there, he travelled back towards London, this time attempting to attack the city from the northwest. At Berkhamsted, Hertfordshire, about 30 miles northwest of London, he engaged with the English army once more and this time was successful (ibid: 597). It is likely that Londoners were involved in both skirmishes with the Normans. Additionally, William's reception into London is not known, but some accounts claim that there was some physical resistance from the City's citizens (Jumièges, 1914: 136; Stenton 1971: 597).

After the conquest, there were periodic rebellions by the English against the Normans. The largest period of fighting occurred soon after William I's coronation, with the majority of the battles occurring in York or other areas in the north of England. William I made sure to heavily fortify London, building the Tower of London, Montfichet's Tower and Castle Baynard within a decade or two of his coronation (Stenton, 1934). These fortifications were meant to not only protect the city from outside attackers, but also to help supress any rebellions from within. This strategy appears to have worked, as there is no record of any

major rebellions occurring in London in the years immediately following the Norman Conquest. Although, due to the fact that the position of coroner was instated to start an inquest into any Norman deaths, it may be assumed that informal skirmishes between Saxons and Normans most likely occurred.

During the Anarchy, between 1135-54, much of the fighting remained well away from London, although at some points the battles came as close as Wallingford. However, after Empress Matilda won at the Battle of Lincoln in 1141, she made her way to London for her coronation (Weir, 2012: 135). The citizens of London were wary of her arrival as forces still loyal to Stephen remained close to the city walls. As she entered the City, they rose up against her and she fled back to Oxford (ibid). While there are not many accounts regarding the casualties during this minor skirmish, it is possible that members of Matilda's forces as well as Londoners were both killed. When Henry II's son revolted in 1173, it is documented that the defences around Montfichet's Tower were strengthened (Stenton, 1934). Despite this, there is no direct evidence of any battles occurring in or around London at this time. Most of the fighting happened in Normandy, Brittany and the north of England.

Unfortunately, there is no direct evidence to suggest that the individuals with perimortem trauma from St Nicholas Shambles were killed during any of the incidents outlined above, and without a more concrete date for the skeletons it is impossible to narrow down the possibilities. In many respects these individuals are quite similar to the males presenting with perimortem sharp force trauma from the parish church of St Andrew, Fishergate in York. They were both buried

in parish churches located in large urban centres. Both are dated to similar periods, with the skeletons excavated from the earlier parish cemetery at Fishergate dating to between the late 10th century and the end of the 11th century (Stroud and Kemp, 1993: 127). And, neither can be attributed to a specific historical event, although it has been suggested that the Fishergate individuals may have been killed either at the Battle of Stamford Bridge or the Battle of Fulford (Knüsel 2014: 268). Both events were skirmishes between the Saxons and the Vikings.

8.7 CONCLUSIONS

The London collections reveal that medieval Londoners may have participated in, and been more susceptible to, violence than other areas of medieval England. Lower status men appear to have been particularly affected by violence, presenting with a large amount of blunt force cranial trauma, potentially inflicted by the use of staves. Women and children were not immune to violence, which may indicate cases of potential domestic violence. Not all violence was interpersonal, however, and several males in the collections presented with trauma potentially received during battle.

CHAPTER 9: CONCLUSION

This study has attempted to create a clearer picture of trauma, specifically that caused by violence, in medieval London by using a biocultural approach which combines the skeletal evidence, which before had been largely ignored, with the historical and cultural evidence from the period. Overall, the results from this study demonstrate that the historical record does not give us the full picture of medieval violence. By adding evidence from the skeletal record, we can start to fill in the gaps and identify biases. Combining the two forms of evidence shows us, perhaps unsurprisingly, that medieval London was not an entirely peaceful place. But, it also shows us that violence in the medieval period is more complex than merely saying there was a "great effusion of blood" (Meyerson *et al.,* 2004).

Altogether, this study provides us with a wealth of new information about the quality of life in medieval London. In the late Middle Ages, London was a bustling urban centre with a diverse population that was constantly in flux, the richest members of society living side by side with the poorest individuals in the country. Yet, despite their close proximity, they appear to have had different experiences in terms of violent transgressions. Lower status men frequented pubs, brawled, and bashed each other over the head demonstrating their power and aggression, while higher status men asserted their masculinity through tournaments and battle. They do appear to have shared one commonality, however, affirming control over their wives through corporal punishment. While women may have experienced few assaults from their parents during childhood,

they could not have expected the same treatment from their husbands; many may have dreaded marriage. And, in all, these patterns may have become even more pronounced during periods of strife. To summarise, this study demonstrates that violence in the city may have differed based on one's sex, age, social status, and during which century one lived. The main results of the study are outlined below.

One of the most definitive patterns identified from the skeletal data was that women in medieval London were not immune to violence. While men appear to have had a greater risk of accidental injury than females, this pattern does not hold true for possible violence-related trauma. This finding is in contrast to the medieval court and coroners' rolls, which suggest a low-level of homicide and/or assault against women. The discrepancy between these two forms of data may be due to a reporting bias in the case of the historical records. Instances of assault by a stranger or neighbour appear to have been prosecuted fairly regularly according to the London court and coroners' rolls, but rarely were cases of domestic abuse reported, unless the abuse became fatal (Chapter 3). Because "appropriate" corporal punishment was condoned in medieval society, if domestic violence was a common occurrence in medieval London it would not have necessarily been recorded in the historical record, and certainly not in the court rolls since it was not a punishable offence (Butler, 2001: 68, 71). If, as the historical records indicate, community-based violence was relatively uncommon and corporal punishment against one's wife was encouraged, the violence-related injuries present amongst females in these collections might indicate that domestic violence was the cause of these women's injuries. Thus, it seems that

male Londoners may have followed the Church's command when it allowed for a certain level of corporal punishment against one's wife in order to keep them obedient. However, it must be noted that domestic violence is not an easily identified behaviour in the skeletal record (Redfern, 2015), and other causes remain plausible.

In contrast, although the Church also allowed for "appropriate" corporal punishment against one's children (Helmholz, 1993: 24), subadults do not appear to have been greatly affected by trauma in medieval London, either accidental or violent. Thus, if men beat their children as often as they beat their wives, for subadults it does not appear to have affected the bone. It might also be that as their progeny, men were less likely to beat, or at least beat to the point of severe injury, their children. Despite the relatively low level of fracture frequency, preliminary comparisons with other studies do show that the prevalence in London may have been higher than in other regions of medieval England. Lewis's (2016) analysis of medieval adolescents suggests that this difference may be a due to growing up in an urban setting rather than a rural one. Specifically, she found that male subadults from cities presented with more fractures and at a younger age than their rural counterparts. While more female subadults from rural locations presented with trauma than urban girls, the urban females presented with fractures starting much earlier in life.

These findings, however, are rather limited in their scope. For one, most studies, including this one, have not specifically focused on evidence for medieval childhood violence. Childhood trauma is often difficult to observe due to robust

healing and bone plasticity, meaning that trauma can often be overlooked if it is not the sole concentration of the researcher. Secondly, it is often impossible to know at what age an individual received a fully healed bone fracture (Chapter 2). Thus, at least some of the trauma observed on adult skeletons in the collections is likely to have occurred during childhood, but is unable to be attributed as such. While some of these limitations are difficult to overcome, more research like Lewis's (2016) that closely analyses childhood trauma in medieval London specifically, and medieval Europe more broadly, could be done to help strength the preliminary findings of both of these studies.

Modern studies suggest that while today there is a greater prevalence of violence amongst lower status individuals than those of higher status, historically individuals from all economic backgrounds participated in violence (Cooney, 1997). This study supports this finding to a degree, demonstrating that there may have been little variation in the prevalence of trauma between social statuses. But, it also shows that the *patterns* of violence between individuals of different social status may have been quite different. Individuals of all social status were susceptible to violent injury, but how that injury occurred most likely differed. While this is a tentative trend and would benefit from further evidence, amongst the London collections a large amount of cranial blunt force trauma was observed on men from lay cemeteries, particularly the parish cemeteries which likely interred members of relatively lower status (i.e. St Nicholas Shambles and the western cemetery of St Mary Graces). Conversely, it is shown that at least some high-status men, particularly those buried in the abbey of St Mary Graces, had a large percentage of rib fractures and less skull trauma.

High status men trained for combat from an early age, and they often died young through their participation in warfare (Waller, 2000b). As they often wore some sort of armour, including a helmet, piercing/cutting trauma to the head and the rest of the body was probably uncommon, although not unprecedented (Appleby *et al*., 2015a). However, even armour cannot always protect from blunt force injuries (Mayorga *et al.*, 2010; Prat *et al*. 2012), and these rib fractures may reflect that.

Many theorists, including Eisner (2003), Pinker (2011), and Gurr (1981), have argued that violence has decreased throughout history. And while this may be true when examining trends on a macroscopic scale, when zooming in on smaller periods of time we can see that violence can fluctuate quite drastically (Tilly, 2003: 66). Amongst the London data, chronological changes in violence were difficult to discern, but a few small patterns did emerge from the data. A tentative chronological difference observed in the London collections was an increase seen in all forms of trauma, both accidental and violent, between females from the earliest centuries (11th-12th centuries) and those from the later ones (13th-16th centuries). The reason for this is unclear, but it may have to do with the degree of freedom and independence a woman was allowed by society, with more freedom equating to more power and ability to resist or escape from domestic abuse. A more definitive chronological result was the peak in the true prevalence of violence-related trauma seen in the St Mary Spital collection during the 1250-1400 time period. As the 14th century was a particularly volatile period (Herlihy, 1997: 39-40; Taylor and Childs, 1990: ix-xvi), the economic,

political, and social instability of the time may have led to an increase in violent behaviour (Fox *et al.*, 2002; Samson and Groves, 1989).

Small blunt force trauma was the dominant form of injury resultant from apparent violent assault in the London collections, and appears to have disproportionately affected the head. This type of violence seems to have been particularly characteristic of those from the parish lay cemeteries and perhaps indicates that those of lower social status were most affected. William Fitzstephen's (1772: 42-43) 12th century observation of the enormous amount of alcohol consumption amongst common Londoners and the large number of London Coroners' Rolls inquests in the 14th century that describe tavern brawls on Sunday evenings, offer a suggestion as to how these injuries may have been received. The size and shape of the cranial depression fractures indicates that staves or other stick-like implements may have been to blame. While staves and other blunt force weapons were not the most heavily cited weapons in the London Coroners' Rolls, this may be due to the fact that the injuries caused from these weapons were unlikely to be fatal. Supporting this argument is that there were only two incidences of perimortem blunt force trauma identified in this research.

Not all injuries were received in drunken tavern fights; a small but significant number of individuals presented with trauma, both healed and unhealed, that may have occurred during a formal battle, particularly the perimortem injuries seen on some of the men from St Nicholas Shambles. Due to the fact that individuals were often buried close to their location of death, the individuals

with unhealed trauma may have been killed in a battle that occurred in or around London. Conducting radiocarbon dating analysis on these skeletons could provide a way of narrowing down the possibilities of which battle or skirmish it was. It also offers a way of potentially identifying individuals as being contemporaneous to each other, further cementing the idea that they may have received their injuries in the same violent event. Unfortunately, such analysis is outside the scope of this thesis, but offers an interesting avenue of future research.

Apart from this thesis's contribution to our understanding of violence and trauma in medieval London, it also aims to contribute most broadly to the current approaches to the study of bioarchaeology. For one, this thesis advocates that trauma frequencies recorded in site reports should not be used as the sole form of evidence in trauma-based studies. The significant difference seen between the number of fractures identified in this study and the number previously recorded in each collection's site report is significant. This discrepancy indicates that trauma recorded through the rapid scanning of the skeletons can often miss a larger number of injuries. If trauma research only uses the fracture frequencies presented in site reports, the results are unlikely to be completely accurate. Secondly, the chronological analysis conducted in this thesis has highlighted the fact that often the dating of certain archaeological sites is quite broadly defined. Future attempts to narrow date ranges, either through radiocarbon dating or more precise stratigraphy, would be beneficial in being able to analyse patterns of trauma (or really any osteological patterns) over time. This is an important area of study, as being able to detect small fluctuations in

the prevalence of violence can greatly contribute to our understanding of life, and in particular economic and political stability, during certain periods (Lessa and Mendonça de Souza, 2004; Šlaus *et al.*, 2012).

Despite its contributions in medieval archaeology and history, this thesis only provides a snapshot of violence in medieval London and it does have its limitations. Perhaps the most restrictive, as with all osteological studies, is the fact that this study only elucidates injuries that affected the skeleton. The majority of soft tissue traumas, which often make up the majority of injuries (Harrod *et al.*, 2012: 73), remain hidden from the skeletal record. This limitation particularly affects our ability to detect injuries to the stomach where there are fewer bones that can be affected by trauma. So, while the skull appears to be the region most affected by violence-related injury in medieval London, we do not know how this compares to the rate of injuries that only affected the soft tissue. The abdomen or other fleshy areas may have been just as, or even more commonly affected, than the skull. Unfortunately, there is no way to fully account for this limitation, but it should be recognised that the trauma recorded in this study is only a portion of all of the types of injuries that medieval Londoners would have sustained.

While the evidence for violence in London is sizeable, a lack of data from other areas in medieval England, and Europe more broadly, make it difficult to put these findings into a wider context. By not being able to compare this data with other regions, we cannot determine how London may have differed from the rest of medieval England or even the rest of the medieval world. The addition of more

data can only strengthen these findings. Specifically, data from other medieval urban centres would help illuminate whether London was unique compared to other medieval cities. A good place to start expanding this research would be in York, where there are already a large number of excavated medieval cemeteries. A closer look at patterns and prevalence of violence-related trauma in this other major medieval English city would provide an interesting counter perspective to this study, particularly as the north was the centre point of a greater number of battles and rebellions than the London area.

Additionally, while there is a wide range of social statuses represented amongst the London collections, there is a lack of a distinct cemetery that interred those of the lowest status. It has been suggested that as much as 25% of the London population was destitute during the medieval period (Schofield and Vince, 2003: 225), and, while some of this population was likely interred in the cemeteries of St Mary Spital, Spital Square, and the western cemetery of St Mary Graces (Chapter 4), they are unable to be distinguished from those of middling status. While currently no excavated human remains exist from such a poor London cemetery, if one should be excavated in the future, analysing the skeletons for violence-related trauma would help strengthen the tentative socio-economic trends highlighted in this thesis.

Overall, it is the hope that this research will encourage similar work in the future. Previous research on medieval violence has provided us with a fairly comprehensive understanding of collective violence, particularly that caused by battles and other skirmishes, but very few studies have focused on attritional

cemeteries and even fewer have compared multiple attritional cemeteries in an attempt to identify and understand interpersonal violence (Chapter 2). More research that specifically focuses on the identification of trauma should be carried out in other urban centres and rural areas throughout the medieval world in order to create a comprehensive understanding of how violence was structured in medieval society. As noted above and throughout this thesis, the patterns and prevalence of interpersonal violence in a society are excellent indicators of economic and political stability as well as social equality within that culture (Fox *et al.*, 2002; Samson and Groves, 1989). The more studies we have that identify, interpret, and compare collective and interpersonal violence in both medieval battlefield sites and attritional cemeteries, the clearer our overall understanding of medieval society in general becomes.

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APPENDICES

Site Information

ST NICHOLAS SHAMBLES (GPO75)

Between the years 1975 and 1978, the Department of Urban Archaeology, part of the Museum of London, excavated the former site of the General Post Office Headquarters Building, located to the north of Newgate Street and to the east of King Edward Street in the City of London (Figures A.1 and A.2). The excavation revealed the remains of the medieval parish church of St Nicholas Shambles as well as 234 articulated burials. The skeletons were recovered and all are currently curated at the Museum of London.

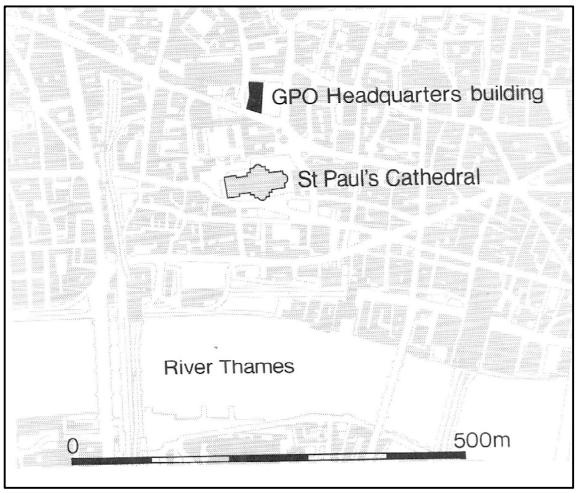


Figure A.1: Map showing the location of the GPO75 site in relation to modern London. © Museum of London Archaeology

It is thought, based on documentary evidence, that nearly all of the northern and eastern parts of the St Nicholas Shambles precinct, including the cemetery, were excavated (White, 1988: 7). The only parts of the precinct that remained

unexcavated, due to modern boundaries, were the very southern and western areas located underneath Newgate and King Edward Streets respectively. However, the site report claims that there was no evidence of burials in the western and southern limits of the site, and this is supported by 14th century documents recording shops and stalls being located in this area (ibid: 8). It thus appears that all possible human remains were fully excavated from the site.

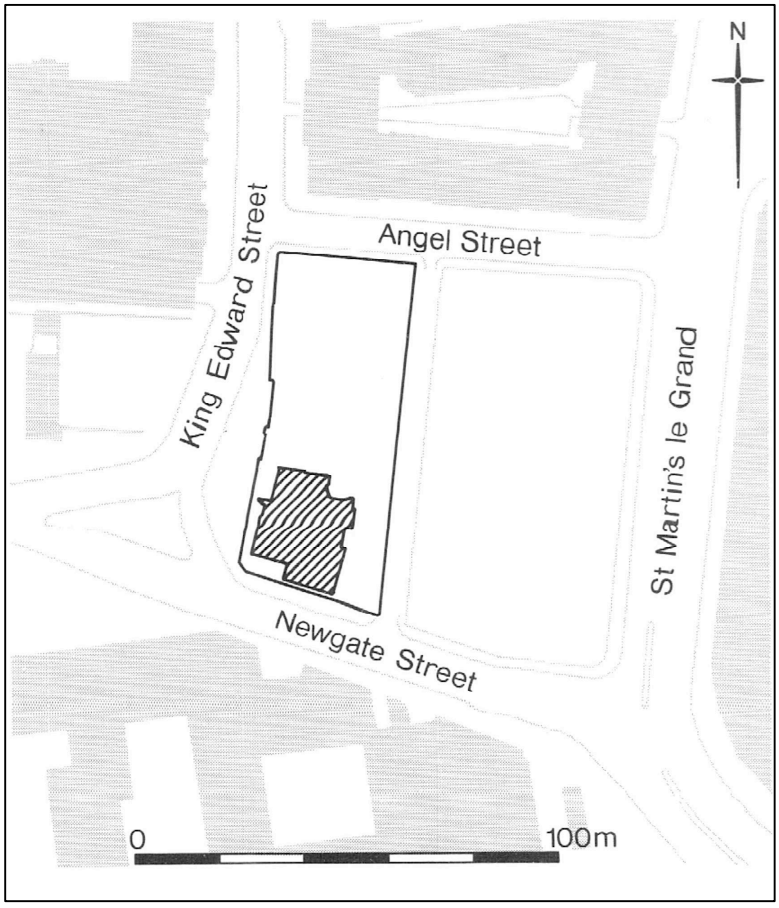


Figure A.2: Map of Excavation Area for GPO75 site. Striped area shows the location of the church and cemetery of St Nicholas Shambles. © Museum of London Archaeology

The dating of the skeletons was done through the identification of pottery found in the soil layers, both corresponding to and underneath the burials (White, 1988: 9). Through this technique, it was determined that the burials most likely dated to the 11th and 12th centuries, with the possibility for later intrusions. Little pottery post-dating 1180 was found in the corresponding soil layers. The

archaeological, as well as historical, evidence shows that the church and churchyard were well in use after this date, possibly until the church's destruction in 1547. However, it is likely that the later burials were destroyed by the construction of 19th century basements (ibid). Unfortunately, the excavators, possibly due to the lack of more modern techniques, had difficultly identifying and stratifying individual grave cuts (Morgan, 1978: 213). Due to this constraint, more precise knowledge of the chronology of the burials is unknown. However, the site report hypothesises that all burials were extramural, and that the burials discovered within the foundations of the north aisle pre-dated its construction (White, 1988: 9; Figure A.3).

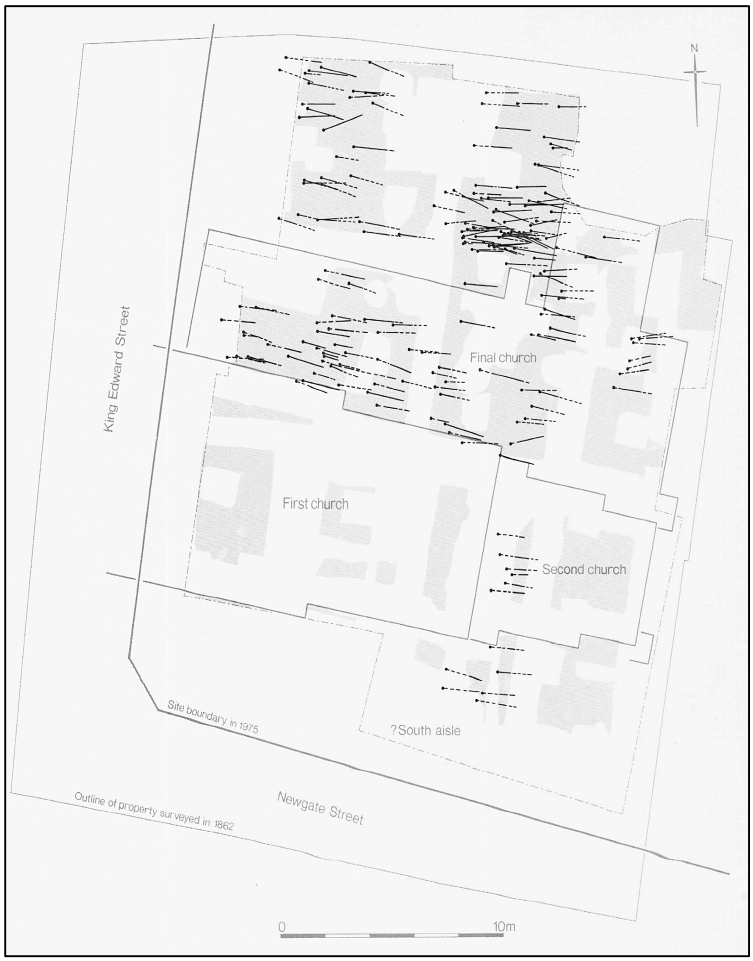


Figure A.3: Map of St Nicholas Shambles site showing the layout of the burials as well as the church. © Museum of London Archaeology

BURIAL CONTEXT

By the late 10th and early 11th centuries, Christianity began to place a stronger emphasis on the Resurrection and Last Judgement (Daniell 1997: 161). This led to an increased importance in burial orientation (facing east so as to see the arrival of Christ) and body position. At the St Nicholas Shambles (GPO75) site burials were supine, with the majority orientated west to east and the arms at the sides of the body (White, 1988: 18; Figure A.3 shows the burial layout). There were six different types of burial. The first type was the most common, found in 189 of the burials, and consisted of a simple burial that may have included a coffin, as evidenced by wood and nails in some of the grave cuts, and/or a shroud, as evidenced by cloth on the skull of one female (ibid). The description of these burials is consistent with other Christian burials of the time (Gilchrist and Sloane, 2005: 106, 111, 152). The rest of the burial types only consisted of 19% (45/234) of all burials. These types contained slight modifications to the simple type I burials and included stone "pillows" around the head (22 burials), grave floors covered in chalk or mortar (10 burials), cists comprised with mortared stones or chalk (8 burials), grave floors and sides lined with charcoal (1 burial), and graves lined with stones or tile (4 burials; possibly in emulation of the cist graves; White, 1988: 18). These variations have been found in other contemporary cemeteries such as ones excavated at Winchester (Old Minster), York, and Raunds (Biddle, 1968: 321; Philips and Heywood, 1995: 87; Boddington, 1996). Combined, these burial practices appear to be transitional, with some having strong foundations in the Anglo-Saxon period (i.e. charcoal burials) and others becoming more prominent in the later medieval period (i.e. shroud burials; Gilchrist and Sloane, 2005; Holloway, 2010). Overall,

all burials appeared to be typical of the period, and no specific characteristics, such as social status or occupation, could be discerned amongst the burials.

Few grave goods were found, as is typical of Christian burials. However, there were three burials that contained a stone or piece of Roman tile on or near the body, and four skeletons had pebbles placed in their mouths (one adult male and three elderly females: 5195, 5189, 5192, 5240; White, 1988: 25). A pebble in the mouth was also found in the skeleton of a young male at Raunds and stones/tiles have been found in several medieval cemeteries, including Kellington Church, Capel Maelog (Wales), and Whithorn (Jones 1988: 27; White 1988: 25; Mytum 1993: 16; Hill, 1997). Daniell (1997: 165) suggests that the pebble in the mouth may have been used to prevent talking at the Resurrection, or perhaps as a way to prevent the person from rising from the dead. Stones and tiles on or near the body may be symbolic of purity, as many of the stones are white (ibid). It is possible that this practice may have had a pre-Christian or early Christian origin since in 1384 William of Wykeham, Bishop of Winchester, forbade 'stone-casting' in cemeteries (Chambers 1971: 72; Daniell 1997: 165; Gilchrist and Sloane, 2005: 145). Besides further cementing the date of these burials, the grave goods found in the St Nicholas Shambles cemetery are, unfortunately, unable to further elucidate who the individuals buried here may have been.

ST LAWRENCE JEWRY (GYE92)

The excavations at Guildhall Yard were carried out in several stages. The Guildhall Museum began the first excavations in the late 1960s and 70s. When

the Guildhall House on Gresham Street was demolished in the 1980s, the Museum of London's Department of Urban Archaeology began a more complete excavation. This more recent excavation covered most of the southeast quadrant of the site, bounded by Gresham Street to the south and Basinghall Street to the east (Bowsher *et al.*, 2007: 2-5). The excavations revealed archaeological remains spanning in time from the late Roman/early Saxon period to the early modern period. Figures A.4 shows a map of the location in relation to the modern City of London and Figure A.5 shows the site plan of the excavation.

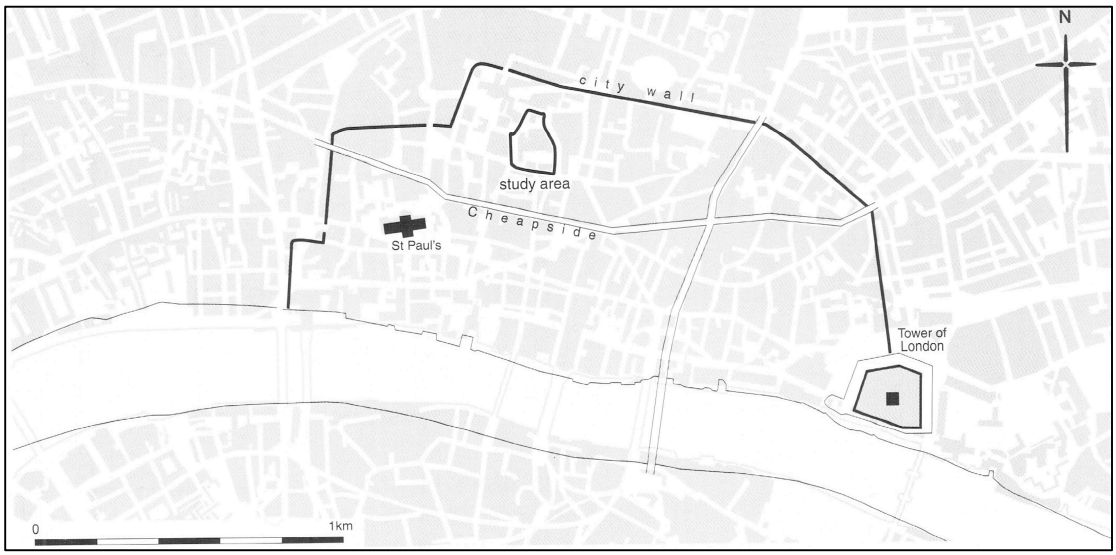


Figure A.4: Map showing the location of the GYE92 site in relation to modern London. © Museum of London Archaeology

Amongst the discoveries of the excavation were the pre-Great Fire remains of the St Lawrence Jewry parish church and its adjacent churchyard. However, only the northeast corner of the cemetery was fully excavated. The burials were split into two areas that were separated by a wattle fence (Bowsher *et al.*, 2007: 21). Because the entire cemetery was not excavated there may be a selection bias as



Figure A.5: Site Plan for the excavation of GYE92. Site D contains the St Lawrence Jewry cemetery and area GM200 & M132 contains the church. © Museum of London Archaeology

to the types of individuals that were excavated. For example, the excavated area may have interred a particular familial group or those of certain social status/occupation. Unfortunately, it is not known what, if any, specific biases

there might be, but the potential for such a bias should be taken into consideration.

Through the use of dendrochronology on pieces of wood from some of the earliest burials, it was determined that the church was originally founded shortly before the Norman Conquest (ibid: 19). The burials were dated using a combination of radiocarbon dating, dendrochronology, and stratigraphy (ibid). Burial from four distinct time periods were discovered: 1050-1140, 1140-1230, 1270-1350, 1550-1666.

BURIAL CONTEXT

The individuals buried at St Lawrence Jewry were predominately in a supine position with the arms at their sides, and were laid out in a west-east orientation, typical of medieval Christian burials (Bowsher *et al.*, 2007: 488-497; Gilchrist and Sloane 2005: 152). The earliest burials were aligned in well-structured rows with no intercutting of the graves (Bowsher *et al.*, 2007: 398; Figure A.6). By the mid-12th and early-13th centuries, however, the burials became more crowded and intercutting of graves was common, perhaps suggesting an increase in the population. Six graves contained multiple burials: five only contained two individuals each, but one contained three (ibid: 409). In five of these burials the bodies were laid out side by side, and in one the two bodies were stacked one on top of the other. All of the multiple burials were dated to between *c.*1170-c. 1200, representing 40% of all excavated individuals dating to this time period. The cause for these multiple burials is unknown, but they may represent either family members who died at a similar time or the

reuse of a specific grave due to overcrowding (Gilchrist and Sloane, 2005: 156-157).

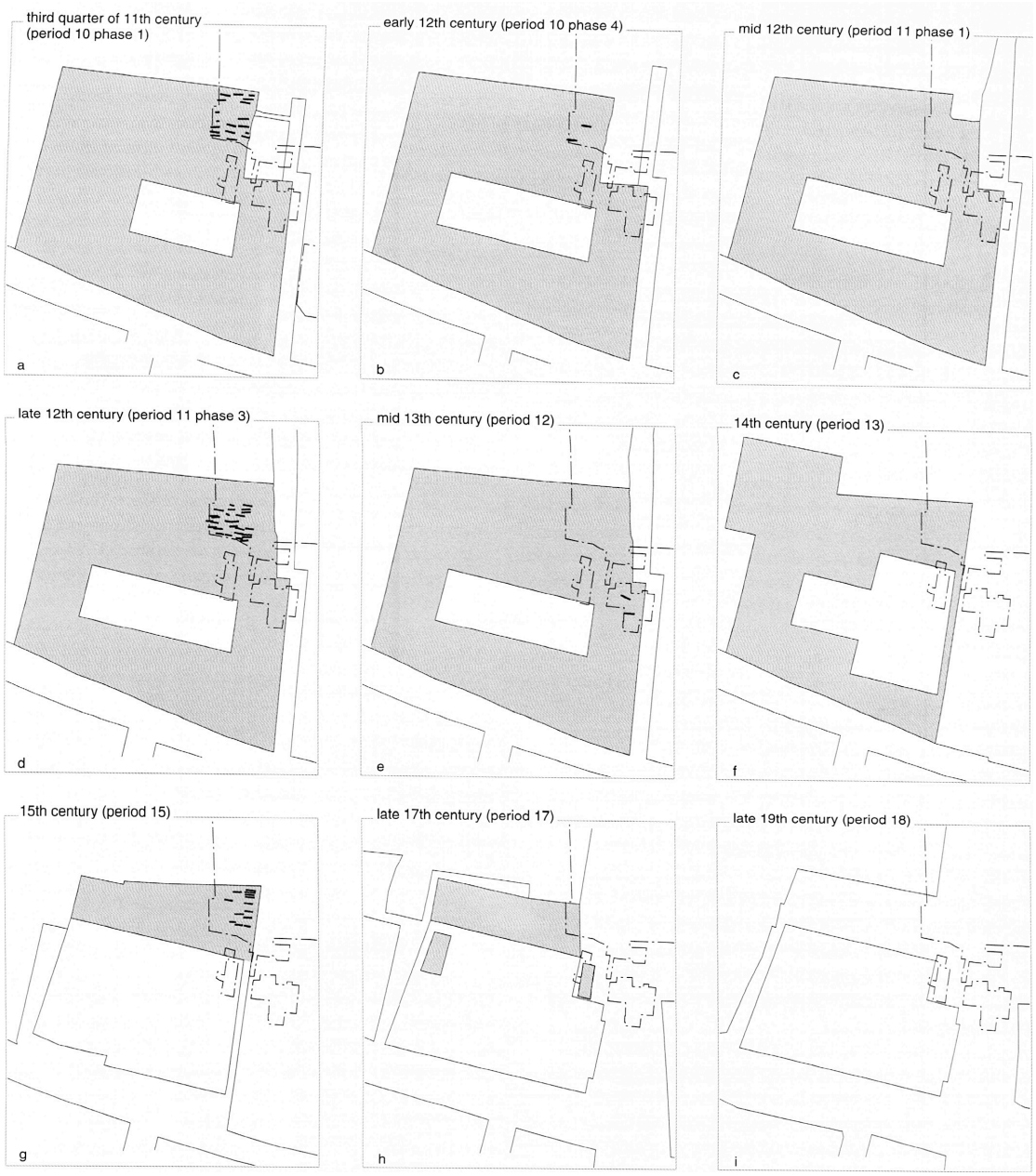


Figure A.6: Layout of burials for GYE92 by time period. © Museum of London Archaeology

From the earliest time period, eighteen burials were excavated from two separate burial areas and were dated using dendrochronology from the timber 'boxes' found in some of the burials, as well as shards of pottery and pieces of cloth. The dates range in time from *c.*1030-1150, with the majority falling

between *c.*1050-80. By the early 12th century, the two separate burial areas were combined into one larger area. Three burials dating to this time period were discovered and appear to be at least 15 years older than the earlier burials based on tree-ring dates. Both the late 11th and early 12th century graves did not overlap and appear to be well separated and aligned with each other suggesting the presence of some sort of grave marker.

By the end of the 12th century, the churchyard appears to have expanded with the northeast corner once again in use after a seventy-year hiatus (Bowsher *et al.*, 2007: 398). These burials began to intercut each other, suggesting a possible spatial limitation. In total, 32 individuals were excavated from 25 graves. Burial practices appear greatly varied during this time with a few multiple burials and the first burials discovered without any evidence of a coffin. However, there was one burial lined with white chalk or lime. Pottery and roofing tiles found in the same soil layers as the burials provide a date of *c.*1180- c. 1240.

A further eighteen burials were excavated. They were dated using dendrochronology to sometime between *c.*1200- c. 1220/40 with some possibly dating to as late as the mid-13th century. Through radiocarbon dating, two burials were dated to between 1260-1410. However, stratigraphy places the burials closer to the late 13th century. Only one burial was dated to be post-1550. Similar to the previous time period, these skeletons displayed signs of extreme overcrowding, as there was a high level of intercutting and no signs of the burials being laid out in rows. Additionally, the same variety in burial practices was

observed in this group of burials as with the slightly earlier burials from the late 12th century.

While only one burial showed evidence of a textile matching that of a shroud, the body positions of the majority of the skeletons, the arms tucked in close to the body and the legs tight together, indicate that the use of shrouds may have been common (Bowsher *et al.*, 2007: 406). There was good preservation of wood in the burials and the large amount found shows that coffins or other types of wooden grave coverings were quite common. In total, there were four different types of wooden coverings found in the cemetery. Thirteen burials exhibited a cover board burial, where planks of wood were laid over the top of the grave (ibid: 400). One multiple burial of a female and subadult, laid side-by-side, had one large cover board across the both of them. Another burial of a subadult had two wooden boards propped up against each other, over the body, to create a roof-like appearance. Five of the burials had both a cover and baseboard with the body sandwiched between the two pieces of wood (ibid: 402). Six of the burials displayed "unfastened" coffins, where six pieces of wood (four for the sides and two for the cover and base) were used to create the appearance of a coffin but they did not appear to be held together by any type of fastener (ibid: 403). This type of burial was found only in the burials from the early 12th century and does not appear to have been used for subadults.

Ten burials, all dating from the earliest burials *c.*1050-80, except for one dated *c.*1100-20, exhibited fully fastened coffins (ibid: 404). Adults and subadults of all ages appear to have been buried in this type of coffin. There was no evidence for

the presence of a coffin in 26 of the burials. While some of these burials were severely truncated and thus evidence for a coffin may have been lost, all but one of the graves dated from *c.*1170- 1230 or later, possibly indicating a shift in burial practice (ibid: 405). This is congruent with other medieval English cemeteries of the time, which shows a distinct decrease in the use of coffins in the late Middle Ages (Gilchrist and Sloane, 2005: 115; Harding, 2002: 59-60). While coffins could be expensive, and perhaps may indicate the burials of a wealthier individual, this decrease in the use of coffins appears throughout medieval England during this century (ibid). Thus, this shift in burial practice appears to be more indicative of the time period than any indication of social status.

As is common with medieval Christian burials, few grave goods were found in the St Lawrence Jewry burials. The most common grave good was a stick or rod, found in four burials: one burial, a male aged 26-35 years, had a rather large (1.58m long) staff buried along the right-hand side of his body, and three other burials had smaller, more flimsy sticks buried alongside them (two females, aged 36-35 and 26-45, and one adult of undetermined age and sex; Bowsher *et al.*, 2007: 408). It has been suggested that burial with a staff may indicate that the individual was a pilgrim or had gone on a pilgrimage (Lubin, 1990). Undertaking a pilgrimage was a relatively expensive affair as funds for food, lodging, and travel were need. Additionally, once arrived at the holy site, the payment of indulgences was often expected. This meant that pilgrimages were usually reserved for those that were relatively well-off financially (Hopper,

2002). If these staves do in fact indicate the burial of pilgrims, this may indicate that these individuals were of a relatively high social status.

Two other burials were excavated which contained apparent grave goods. One female, aged 26-45, was buried with padlock over her pelvis (possibly signifying virginity or chastity or perhaps merely a residual find; Bowsher *et al.*, 2007: 408). Another female, aged 26-45, was found with a copper-alloy bell, possibly of the sort that were used in Mass during the Eucharist (ibid). The interpretative importance of such items is unknown.

SPITAL SQUARE (NRT85)

Three trial excavations for the Spital Square site were carried out by the Inner London Archaeological Unit (ILAU) in the years 1976, 1977, and 1982 (Thomas *et al.*, 1997: 4). The Department of Greater London Archaeology from the Museum of London began a full-scale excavation of the site in 1985, and again from 1988-1989. The excavations revealed part of the medieval priory and hospital of St Mary Spital without Bishopsgate (ibid). The NRT85 site code was established for the part of the excavation carried out at 4-12 Norton Folgate Street, the southwest corner of Spital Square (ibid: 5). Figure A.7 shows the location of the site in relation to the modern City of London.

There were two cemeteries located on the Spital Square site: the early infirmary cemetery located to the west of the infirmary building, and the main cemetery located in the southeast corner of the precinct. The early infirmary cemetery was

the one excavated from Spital Square in the 1980s with the site code (NRT85). Part of the main cemetery was also excavated at this time (site code: SPT82), but the whole of the cemetery was not excavated until the 1990s. The skeletons from that site are discussed in the St Mary Spital (SRP98) section below. Figure A.8 shows the site plan of the excavations and the location of each cemetery.

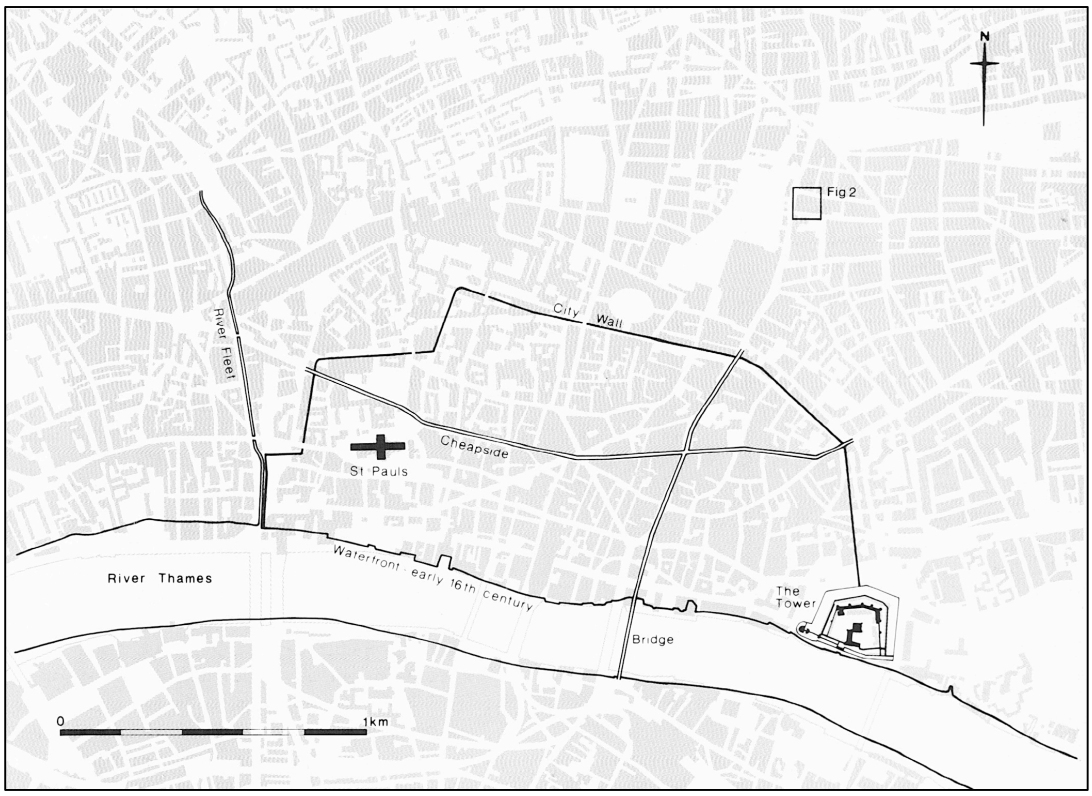


Figure A.7: Map showing the location of the NRT85 and SRP98 sites in relation to modern London (Box labeled Fig 2). © Museum of London Archaeology

The graves from the early infirmary cemetery (NRT85) were dated to between 1235-1280, the period directly following the refoundation of the priory and hospital. They were dated through a combination of stratigraphy and residual material finds in the corresponding soil layers (Thomas *et al.*, 1997: 41). The end date of the cemetery is evidenced by the construction of an addition to the infirmary on top of the eastern end of the site, which cut through several of the graves, truncating them (ibid: 37).



Figure A.8: Site Plan of the St Mary Spital excavations. Area B is the location of the NRT85 burials and Area U is the location of the SRP98 burials. © Museum of London Archaeology

BURIAL CONTEXT

There was a total of nine rows, running north to south, in the infirmary cemetery with a maximum of 25 graves in each row (Thomas *et al.*, 1997: 37). However, the westernmost row only contained five graves. The majority of graves were well spaced with only a minor degree of intercutting between them (Figure A.9). This was mainly seen in the two easternmost rows (ibid). Based on the layout of the graves, it appears that burials began in the northeast corner of the cemetery, suggesting that the largest amount of intercutting seen in the cemetery occurred in the earlier part of the time period. Whether this indicates a period of high use for the hospital or some other phenomenon is unknown.

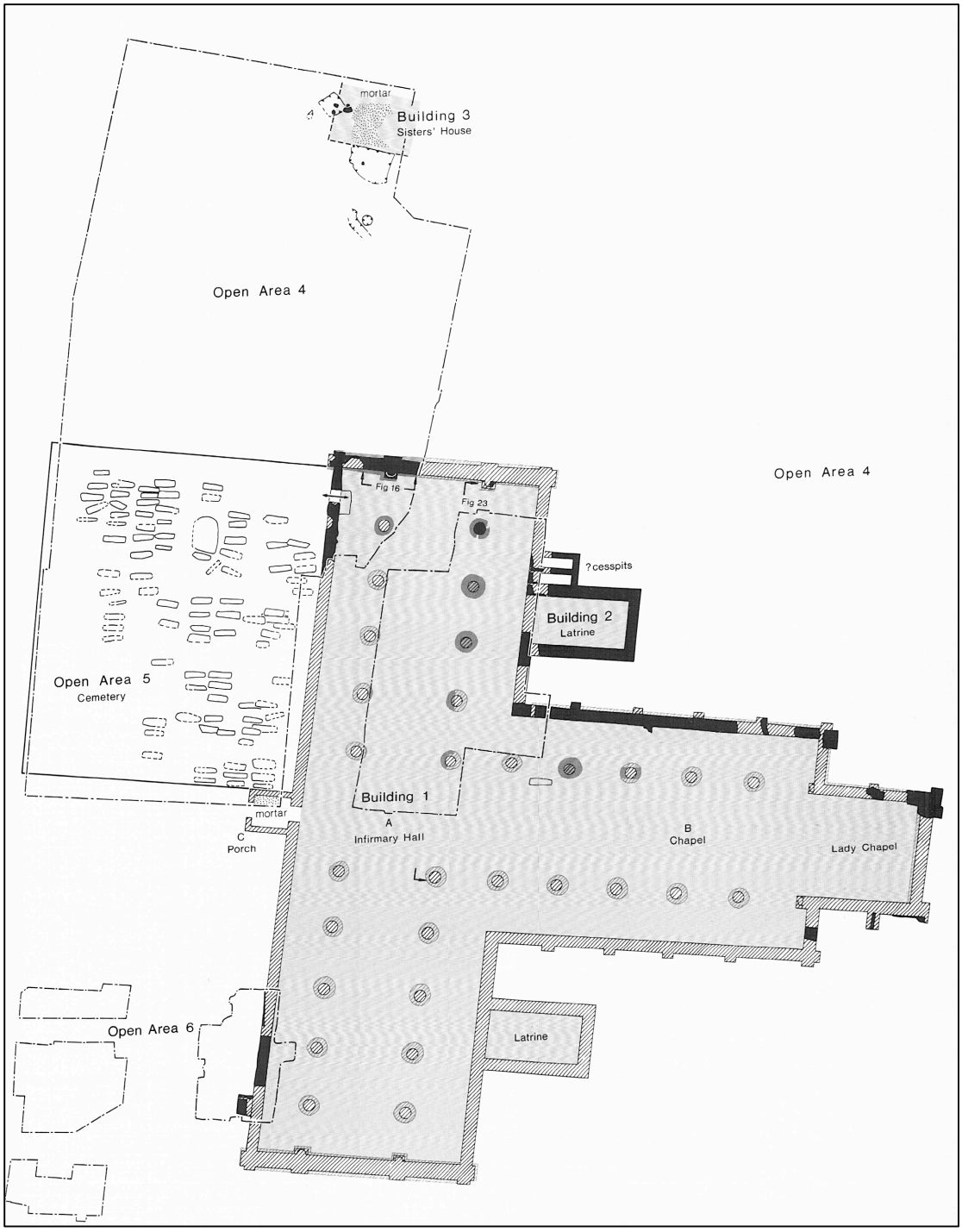
There was one mass grave with five individuals interred within it. The rest of the skeletons were all single inhumations, orientated west-east, and in a supine

position (Thomas *et al.*, 1997: 38). There was one exception, a neonate, which was buried in a prone position (ibid). It is possible this child was buried in a prone position because he or she was unbaptized at the time of death. Five of the graves contained evidence of a coffin, specifically nails and wooden pegs (ibid: 37). As no wood survived, it is unknown if these were fully fastened coffins or not (ibid: 37-38). Due to the position of the arms close to the body, it is likely that many of the skeletons were buried in a shroud (ibid: 38). It is interesting that hospital inmates were buried in a coffin, which might have been considered expensive at the time, particularly before the 14th century. This may be due, however, to a link seen between epidemic crises and the use of coffins (Gilchrist and Sloane: 2005: 115); perhaps coffins were seen as a way of preventing the spread of disease. In any case, great care with these burials seems to have been afforded, perhaps indicating that the hospital inmates were well cared for.

Grave goods were rare. Two graves contained belt buckles, which may have been used to fasten the shrouds (Thomas *et al.*, 1997: 38). A padlock and key (which did not correspond to the lock) as well as a thimble were found in two other graves (ibid: 39)[68]. An Eidsborg schist hone was also found in one grave (ibid). Whether this indicates that the individual associated with the hone hailed from Norway or that this is merely a residual find is unknown. But, it may indicate that if not this individual, then other individuals associated with the hospital may have been immigrants from other parts of Europe.

[68] Although, it is possible that this was dumped in a grave fill and not associated with the buried individual.

Figure A.9: Map showing the NRT85 burial layout (Open Area 5). © Museum of London Archaeology



ST MARY SPITAL (SPR98)

Covering a total of four hectares, and including over 25 different sites, the excavations carried out at Spitalfields Market comprised one of the largest archaeological projects conducted in the United Kingdom, and certainly the

largest within London (Connell *et al*., 2012: 1-2). As noted above, initial excavations were carried out in the 1970s and 1980s, but the full-excavation of the priory precinct was not carried out until the 1990s and early 2000s. The majority of the excavations unearthed the medieval priory and hospital of St Mary Spital, which in medieval times was located about 400m north of the City of London's walls (Figure A.7). The later phases of the project included the entire excavation of the main cemetery, which was only partially excavated in the 1980s excavations of Spital Square (Figure A.8). It is the skeletons unearthed during this phase that are analysed in this section. Figure A.10 shows the location of the cemetery in relation to the abbey.

The graves were dated using stratigraphy and confirmed through the radiocarbon dating of bone with 84% accuracy (Connell *et al.*, 2012: 3). Four distinct burial periods were identified: 1120-1200, 1200-1250, 1250-1400, and 1400-1539. The end of the last period reflects the closing date of the priory, but burials may have ceased before then, possibly sometime between 1485 and 1525.

BURIAL CONTEXT

With few exceptions, the skeletons were oriented west to east and laid out in a supine position, typical of late medieval burials (see above). The site report groups the main cemetery (SRP98) burials into five distinct categories. Type A burials were simple, single inhumations, which accounted for roughly half of all burials (Connell *et al.*, 2012: 13). Type B burials consisted of single, horizontal burials with two to seven individuals per grave (ibid). Type C burials were

categorised as stacked burials, with the bodies lying one on top of the other, and consisted of two to eleven individuals per grave. These three types of burials, when grouped together into Type ABC, represent the average mortality rate of the living population and the site report refers to these burials as the attritional cemetery (ibid).

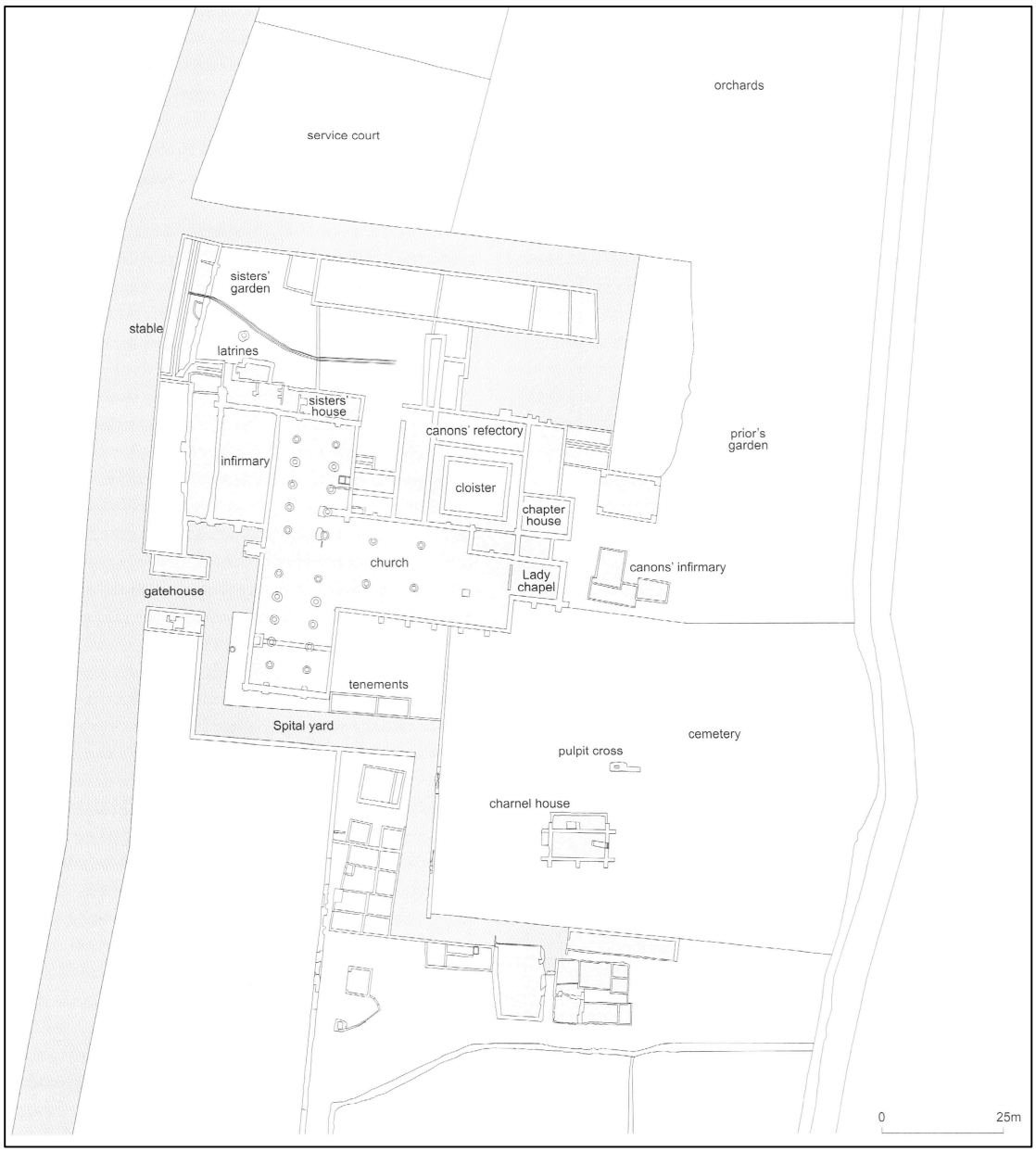


Figure A.10: Map of the medieval St Mary Spital precinct showing the location of the main cemetery (SRP98). © Museum of London Archaeology

Type D burials are comprised of mass burial pits in which a large number of individuals were laid out in multiple horizontal rows and/or stacked on top of each other. For the most part, the bodies were laid out haphazardly and not given the same care as the individuals buried in the attritional cemetery. These burials are referred to as the catastrophe cemetery, and each mass grave typically contained eight to 45 bodies (Connell *et al.*, 2012: 13). While many of these mass burials only contained two or three individuals, there were more than 100 burial pits that contained 15 or more individuals, with the largest containing 43 individuals (ibid: 217). The mass burial pits most likely indicate periods of high mortality, and potentially periods of epidemics. Type E burials included any burials that were unable to be categorised into one of the types listed above (ibid: 13).

There were a few grave goods associated with the skeletons. Eight skeletons were buried with chalices, which may indicate that they were members of the clergy (Connell *et al.*, 2012: 201; Gilchrist and Sloane, 2005: 160). There were also four individuals buried with papal *bullae* in their hands, the possession of which increased after the Black Death, possibly as a way of warding off demons or disease (Gilchrist and Sloane, 2005: 96). Gold coins from the reign of Henry VIII were associated with seven burials. The King sometimes donated these coins to individuals suffering from certain illnesses (Connell *et al.*, 2012: 201). To be in possession of either papal *bullae* or gold coins given by the King suggests that at least some of the individuals buried in this cemetery were of high status (Gilchrist and Sloane, 2015: 95). This supports the historical evidence laid out in Chapter 4, which suggests that the main cemetery of St Mary Spital interred a

diverse population, which included both poor inmates of the hospital, the clergy, and wealthy benefactors.

BLACKFRIARS (PIC87)

The area located southwest of St Paul's, covering the current addresses of 54/56-66 Carter Lane, 1-3 Pilgrim Street, and 25-37 Ludgate Hill, was excavated in three phases between November 1987 and February 1990 (Watson, 1990: 9; Figures A.11 and A.12). The excavations, which were carried out by the Museum of London Archaeology Unit, revealed the Norman fortress, Montfichet's Tower, and part of the later medieval Blackfriars complex. The excavated area revealed the Blackfriars churchyard and the northern end of the church and cloisters. All of the burials recovered were extramural burials from the churchyard.

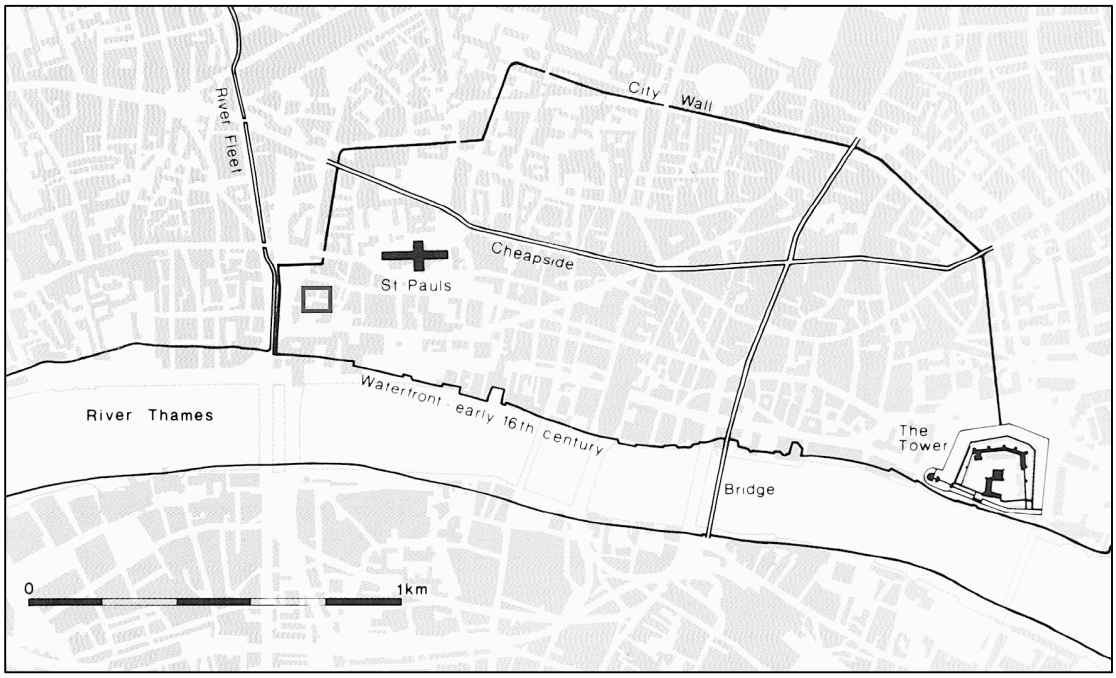
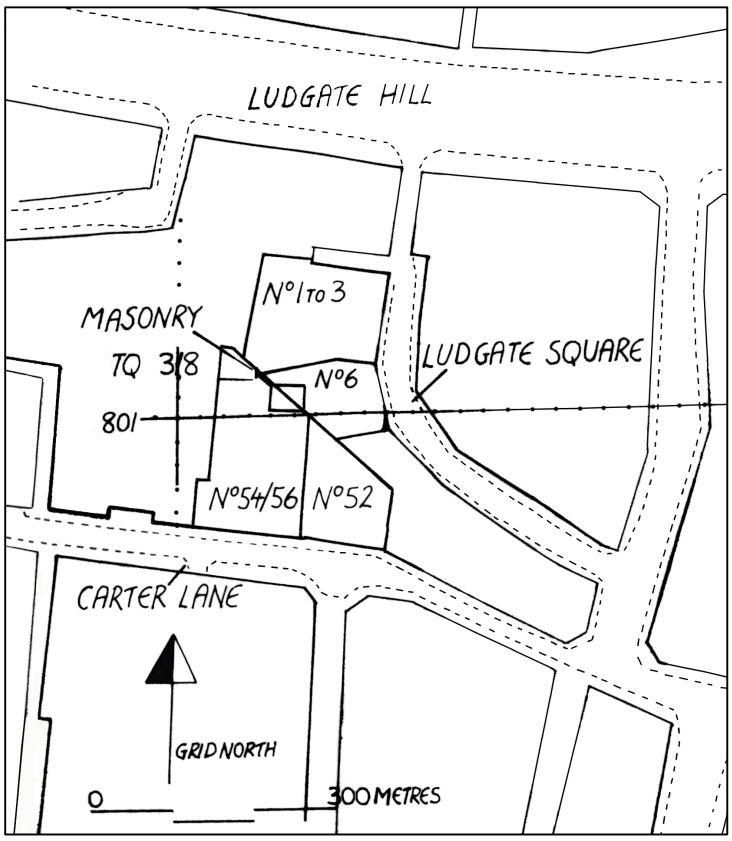


Figure A.11: Map showing the location of the PIC87 site in relation to modern London (Black box). © Museum of London Archaeology

The cemetery was located in the north end of the Blackfriars precinct, next to the church. The full size of the cemetery is unknown. While no graves were found to

the north or east of the excavated site, it is likely that there are some graves west of the site, under the unexcavated area of 68-74 Carter Lane (Watson, 1990: 48). Thus, as with the burials from St Lawrence Jewry, there may be a potential bias in the excavated population since the entire buried population is not represented in the collection. What this bias may be, however, is unknown. Historical documents indicate that the churchyard was used for burials up until the friary's closure during the Dissolution (Palmer, 1891). The friary records indicate that intramural burials were located in the church, St Anne's chapel, and the cloisters. Using stratigraphy and material finds, the majority of the graves were dated to early in the friary's foundation, between 1250-1350 (Gavin, 1988; Watson, 1990: 53). But, at least two of the graves may have had a burial date as late as the 16th century (ibid).

Figure A.12: Site Plan of Carter Lane (PIC87) excavations.
© Museum of London



BURIAL CONTEXT

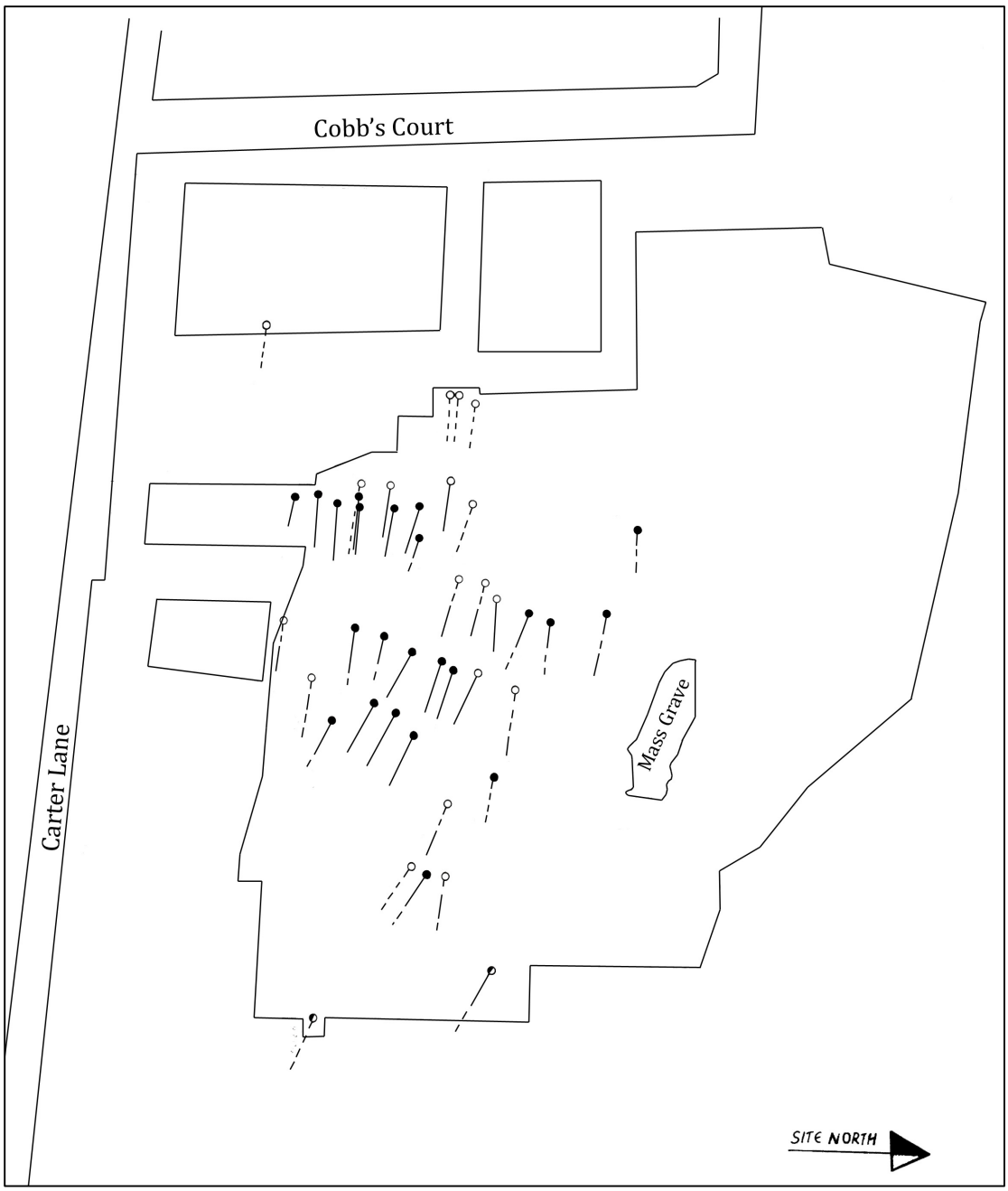
Like most late medieval burials, the graves were aligned west to east, with the heads to the west (Gilchrist and Sloane, 2005: 152; Figure A.13). While many of the skeletons were quite fragmentary, the posture of the some of the more complete ones indicate a supine position with the arms either by the sides of the body or crossed on top of it (Watson, 1990: 56). In all, the burials appear to be typical of the period and no important variation in burial practice could be discerned.

Evidence of pins in some of the burials may indicate the use of shrouds. Additionally, there was evidence of coffins found in 23 out of the 59 individual graves (ibid: 59). One of the coffins was made of lead and the rest of wood. Some of these coffin remnants contained evidence of chalk/lime or charcoal (ibid: 59). This is unusual as burials including these minerals were more common during the Anglo-Saxon period (Holloway, 2010). In the churchyard, the graves were relatively well spaced with little overlap, suggesting the use of grave markers (ibid: 55).

All but two graves had single inhumations. One was a double burial and the other was a mass grave found in the churchyard, which revealed 13 individuals, including six subadults. These individuals were severely fragmented, but the ones that were complete enough to analyse included context numbers 233, 234, 242, and 243. A copper belt buckle, associated with one of the skeletons in the mass grave, indicates that these inhumations may have an early 16th century date (Watson, 1990: 61). Since the individuals are in various postures with some

prone or bent at odd angles, they may have been buried in haste, possibly victims of an epidemic (ibid).

Figure A.13: Map showing the burial layout of PIC87 burials. © Museum of London



The copper belt, noted above, was the only grave good associated with any of the excavated skeletons. As such, nothing of note, besides confirming the date of mass burial, could be discerned through the analysis of grave goods for this site.

ST MARY GRACES (MIN86)

The former site of the Royal Mint, in East Smithfield, just to the west of the Tower of London, was excavated between June 1986 and June 1988 (Figures A.14 and A.15). During medieval times the site was located just outside the city walls. Three individual historic sites were uncovered in this process: the large Black Death cemetery of East Smithfield (1348-1350), the Cistercian Abbey of St Mary Graces (1350-1539), and the Royal Navy victualing yard (1560-1785). The two cemeteries analysed in this report were contained within the St Mary Graces site and therefore are the focus of this section.

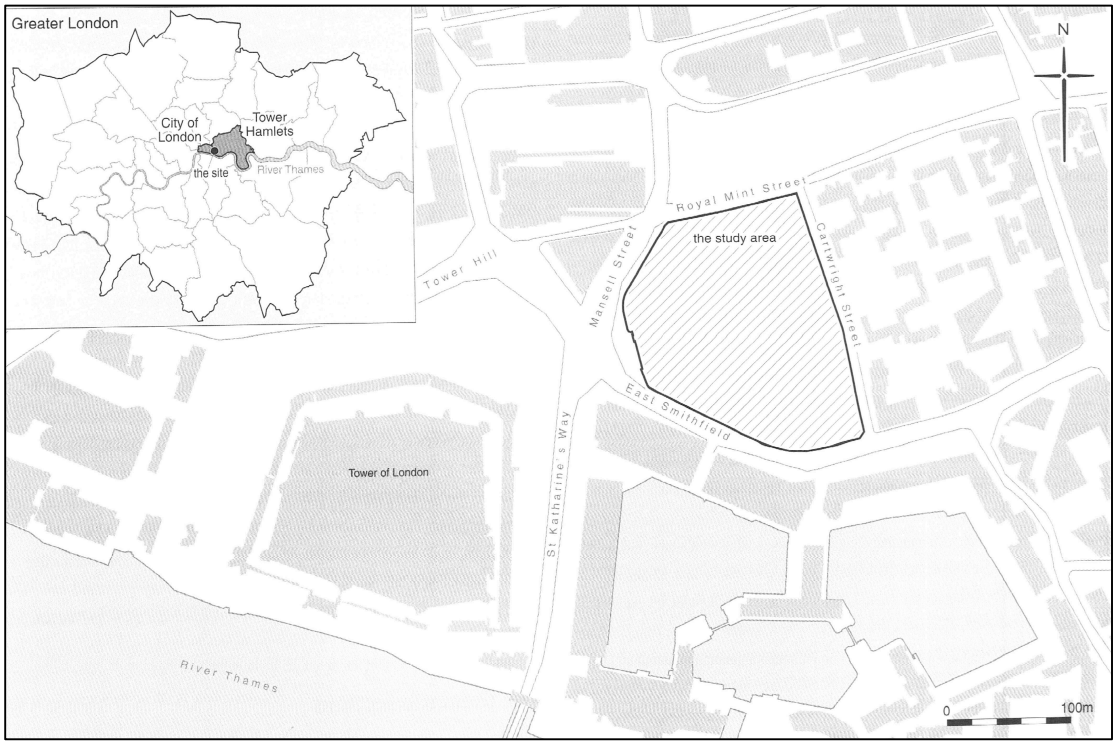


Figure A.14: Map showing the location of the MIN86 site in relation to modern London. © Museum of London Archaeology

The St Mary Graces assemblage consists of two separate sites: the abbey precinct of St Mary Graces and the western cemetery, a supposed burial site for later victims of the Black Death (see Chapter 4 for further details). The abbey precinct includes both extramural burials from the abbey churchyard and intramural

burials from the abbey church and cloisters. The abbey precinct graves are dated to 1361-1539: abbey churchyard burials date from 1400-1539 and the intramural burials from 1361-1539. The graves of the western cemetery date to between the years 1350-1400. Both archaeological and documentary evidence suggests that burials in the western cemetery stopped sometime around 1405 when the area began to be used as a convent garden (Grainger and Phillpotts, 2011: 55). All graves were dated using stratigraphy and residual finds discovered in the corresponding soil layers (ibid).

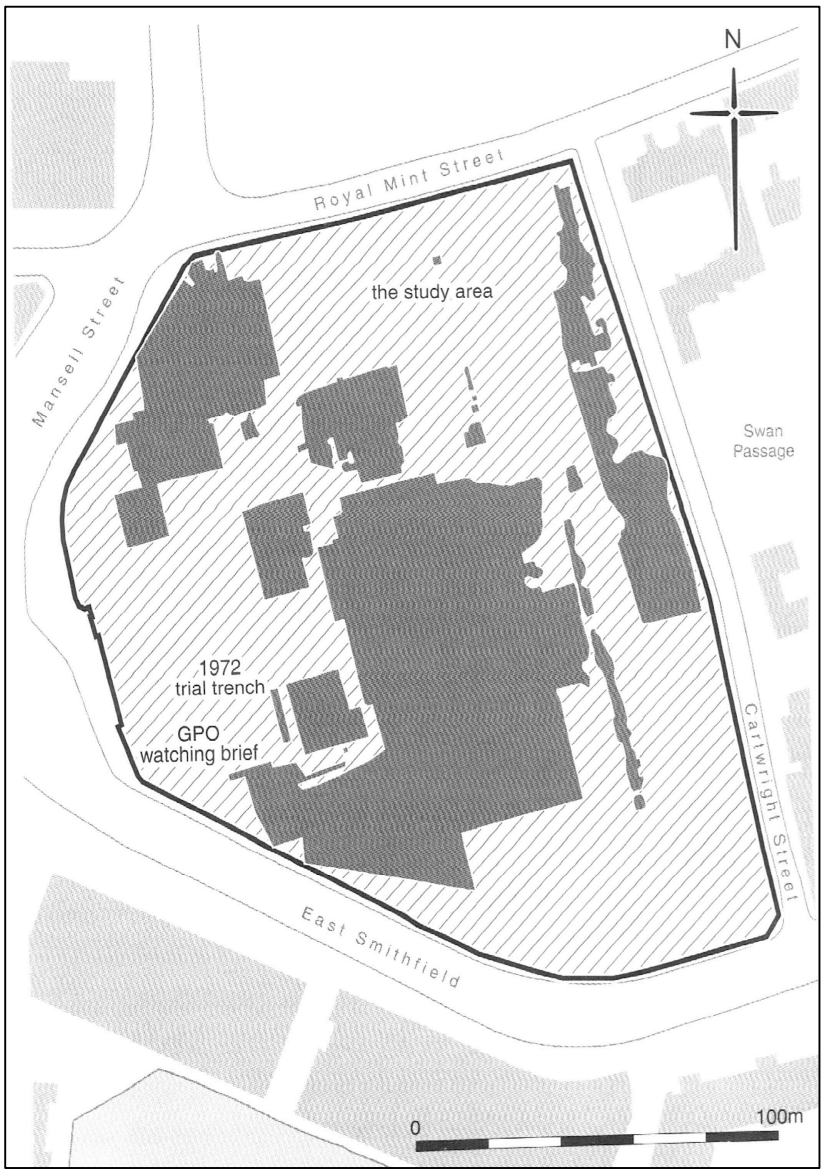


Figure A.15: Site Plan of the MIN86 excavation site. © Museum of London Archaeology

The western cemetery lay on top of the older East Smithfield Black Death cemetery (1348-49). The entirety of the cemetery was excavated and burials were found throughout, except for at the eastern edge (Grainger *et al*., 2008: 9; Grainger and Phillpotts, 2011: 33). This may be due to a large layer of clay in the area, which would have made it hard to dig through. The abbey churchyard, located on the northern edge of the precinct, was fully excavated and burials were found throughout (ibid: 54). Intramural burials were discovered in the presbytery, nave, porch, south chapel, St Anne's chapel, and the cloisters (ibid). There is no indication that the surviving intramural burials were not fully excavated.

BURIAL CONTEXT

In the western cemetery, there were a total of 12 rows of burials, with 221 burials in total (Grainger and Phillpotts, 2011: 33). Stratigraphy indicates that the earliest burials were very distinct and well-aligned in rows, but then, over time, intercutting became more commonplace (ibid: 102). The layout of the western cemetery was very similar to the Black Death cemetery underneath it, including the two separate groupings of infant and child burials: one near the western border of the site and the other on the southern edge (ibid: 33). This supports the historical record outlined in Chapter 4, which suggests that this cemetery was a continuation of the earlier Black Death cemetery of East Smithfield.

All of the burials in this cemetery were supine and arranged to an east-west alignment. A little less than half of the burials (102/221; Figure A.16) contained

evidence of coffins, either through fragments of wood, wood stains, or coffin fittings such as nails. One burial, containing an adult of undetermined age and sex, was lined with charcoal (ibid). Multiple burials were not common with only three graves containing two individuals each. While the presence of coffins and a lack of mass graves seem counterintuitive for a catastrophe cemetery, these were also characteristics of the East Smithfield cemetery, which is inarguably a Black Death cemetery.



Figure A.16: Map showing western cemetery burials (Open Area 2) and the early intramural abbey burials (MIN86). © Museum of London Archaeology

As is common with medieval Christian burials, few grave goods were found in the western cemetery. Three copper-alloy objects (one cruciform mount, one

brooch, and buckle) were found in three separate graves (ibid). They do not provide any further insight into who was buried in this cemetery.

The churchyard of St Mary Graces was most certainly a part of the St Mary Graces abbey precinct. Excavations revealed a total of 91 burials spread out over nine rows (Grainger and Phillpotts, 2011: 54; Figure A.17). As with the western cemetery, the earliest burials appear to be well separated and aligned with more intercutting happening throughout time. Both males and females were buried in the cemetery, but very few subadult burials were discovered (ibid). Whether this is due to the fact that few subadults were actually buried in this area, or that the area of subadult burial was not uncovered, is unknown, but it may reflect a potential bias in the demography of this collection. All of the individuals were buried in a supine position and in an east-west alignment (ibid: 104). There is not much evidence for varying burial practices. Twenty-eight graves appear to have contained coffins, from evidence of residual wood, wood stains, or coffin fittings. There was also one coffin burial that appears to have been lined with charcoal (ibid). This is an unusual find for a burial from the late medieval era, as the practice appears to have been most common during the Anglo-Saxon era as well as during the 11th and 12th centuries (Holloway, 2010). One grave was used as a charnel pit and contained the remains of at least 47 individuals (Grainger and Phillpotts 2011: 54). There is almost no evidence for grave goods with only one copper-alloy shoe buckle found in one burial and whether this was actually a grave good or a residual find is undetermined (ibid).

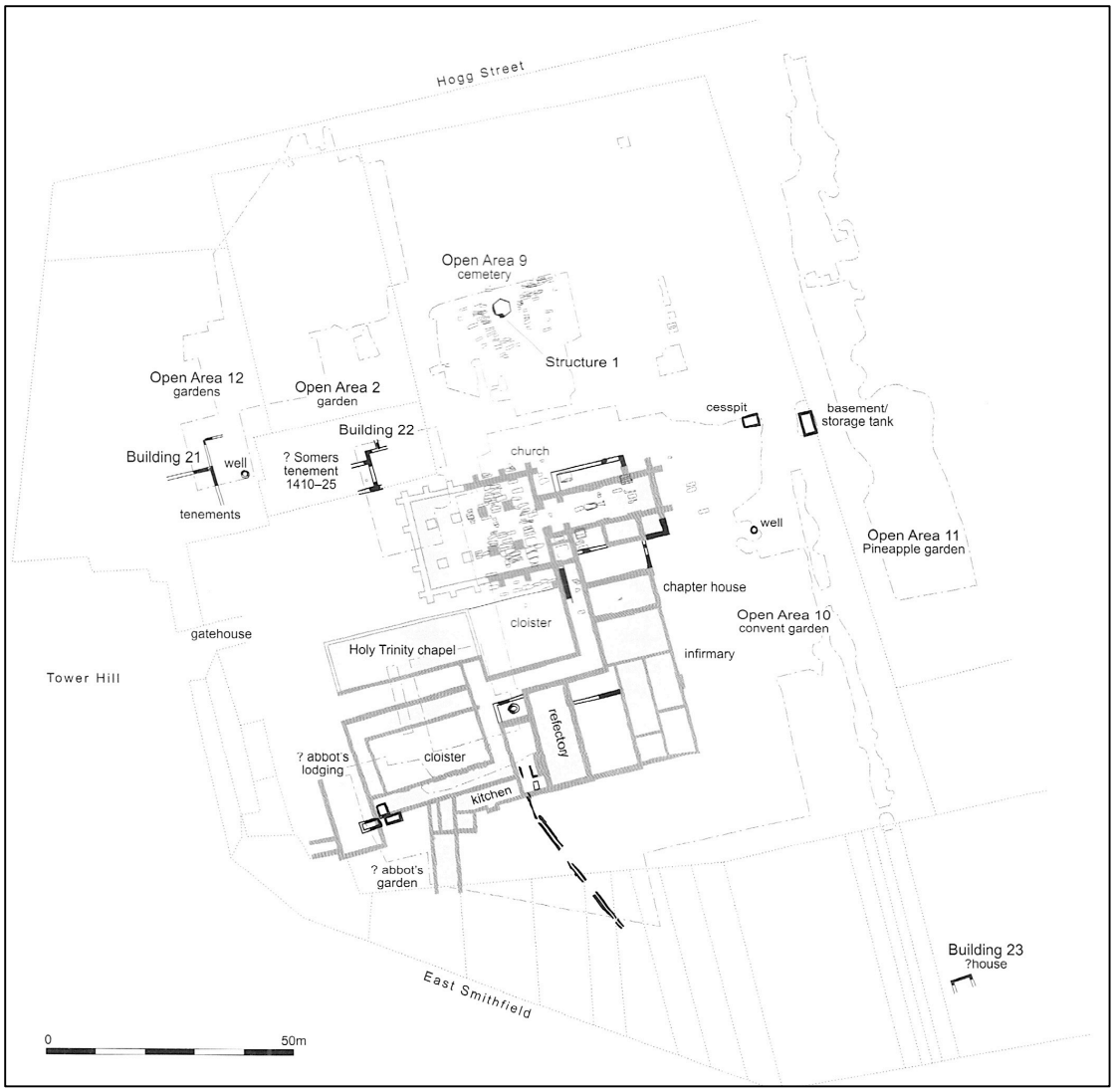


Figure A.17: Map showing abbey churchyard burials (Open Area 9) and the later intramural abbey burials (MIN86). © Museum of London Archaeology

There were 112 intramural abbey burials: 69 individuals were buried in the nave, ten in the presbytery, eight in the St Anne's chapel, eight in the cloisters, four in the porch and three in the south chapel. Several of the graves presented with evidence of a wooden coffin, but it does not appear to have been common (Grainger and Phillpotts 2011: 104). Two coffins were lined with chalk or lime, possibly used to help preserve the corpse (ibid: 105). Only one burial, located in the nave, was lined with charcoal (ibid: 21). At least three individuals were buried in stone vaults. Additionally, many fragments of tomb slabs were

discovered, suggesting the use of them as a cover for under-floor burials (ibid: 105). One individual, buried in the south chapel, was the only individual to present with textile evident of a shroud (ibid: 104). However, this lack of evidence does not mean that it was not used for other burials from this site. Overall, there was not much variation in burial practice and no grave goods were found, meaning that little new information could be discerned from the burial context.

ST BENET SHEREHOG (ONE94)

The area in and around 1 Poultry in the City of London, including the addresses of 1-19 Poultry, 2-38 Queen Victoria Street, 3-9, 35-40 Bucklersbury Street, and 76-80 Cheapside, were excavated by the Museum of London Archaeology Service (Figures A.18 and A.19). The excavations revealed the medieval church of St Benet Sherehog, including intra- and extramural burials, as well as the post-medieval burial ground for the St Benet Sherehog parish. The entirety of the site was excavated (Miles and White, 2008).

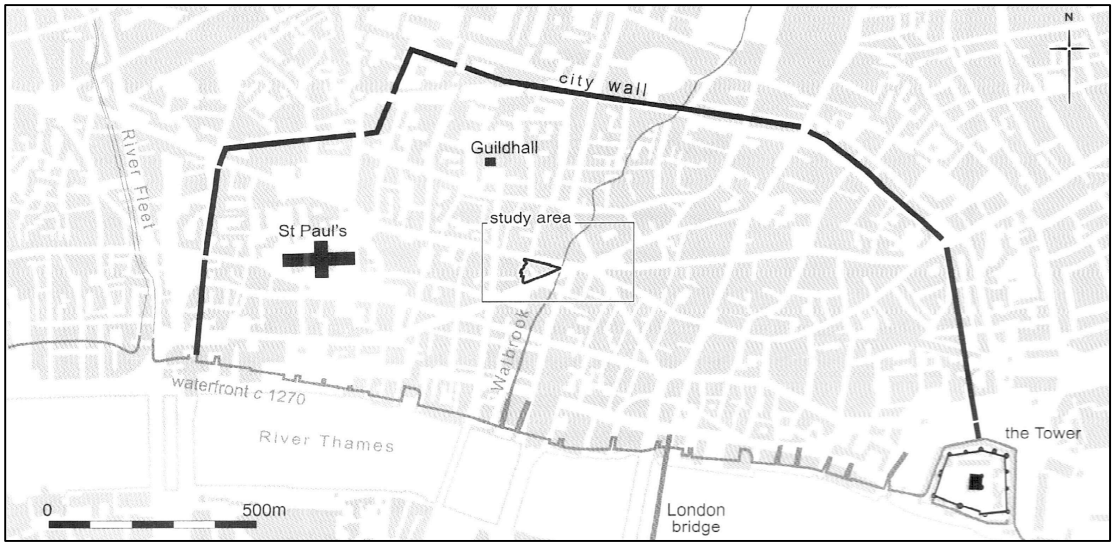


Figure A.18: Map showing the location of the ONE94 site in relation to modern London.
© Museum of London Archaeology

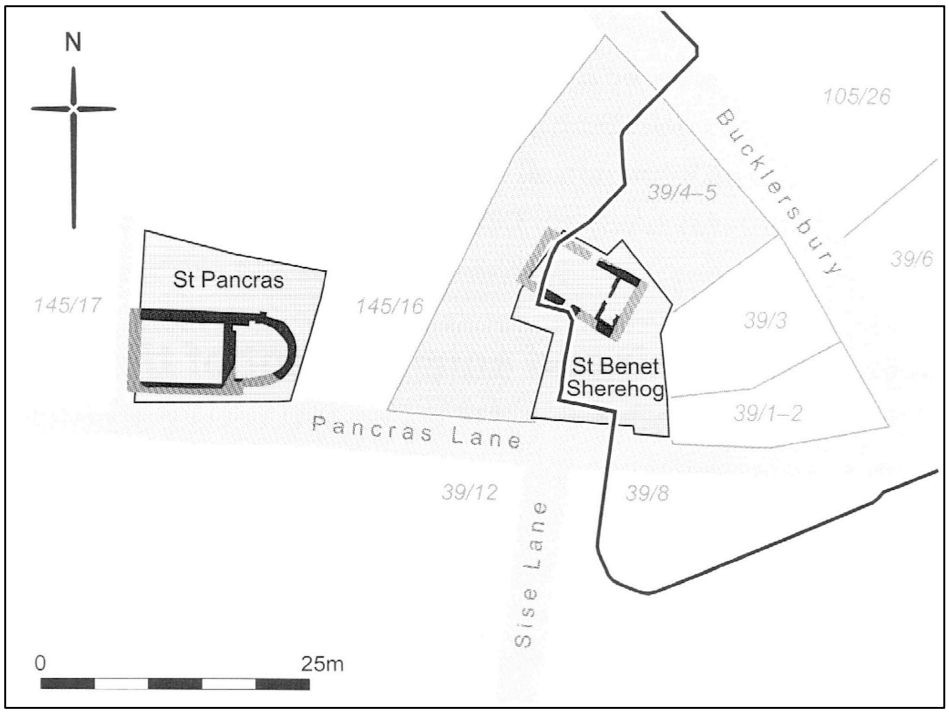


Figure A.19: Site Plan of the ONE94 excavations. © Museum of London

The medieval burials were the ones analysed for this research. Using stratigraphy and residual finds, they dated to two overlapping periods (Miles and White, 2008). Eight skeletons dated to between 1250 and 1500 and a further thirteen were dating to between 1280 and 1666.

BURIAL CONTEXT

While the majority followed the east-west burial pattern as was common at the time, some burials were angled into an almost north-south alignment. All of the angled burials were near the north wall, which was irregularly shaped, possibly accounting for the slight alteration in burial alignment (Miles and White, 2008). The majority of the St Benet Sherehog burials were in coffins and no grave goods were discovered (ibid). Apart from the slight irregularity in burial position due to topography, no new information regarding the makeup of individuals buried at this site was discerned.

Example of Skeletal Recording Sheet

Context #	Sex	Age Est.	Preservation	Diaphyseal Length		Pathology Description
				Right	Left	
PIC87 32	F?	36-45	Good	Fem: 470mm	Fem: 468mm	Oblique fracture to the distal third of the right ulnar diaphysis

Lower axial									
L limb	**R limb**	**L Ankle**	**R Ankle**	**L Tarsals**	**R Tarsals**	**L Metatarsals**	**R Metatarsals**	**L Pelvis**	**R Pelvis**
Femur, tibia	Femur, tibia, fibula	Calcaneus, talus	Talus	Cuboid	Cuboid, navicular	1, 2, 5	1, 2, 4	Ilium, ischium	Ilium, ischium, pubis

Upper axial						
L Ribs	**R Ribs**	**Sternum**	**Cervical vertebrae**	**Thoracic vertebrae**	**Lumbar vertebrae**	**Sacrum**
10	8	Present	1, 2, 4, 5	1, 3, 4, 5, 6, 10, 12	3, 4, 5	Present

Upper axial					
L Limb	**R Limb**	**L Carpals**	**R Carpals**	**L Metacarpals**	**R Metacarpals**
Humerus, radius, ulna	Radius, ulna	Trapezium, lunate, scaphoid	Trapezoid, capitate, hamate	1, 3, 4, 5	2, 3, 4

Skull							
L Mand	**R Mand**	**L Max**	**R Max**	**L Nasal**	**R Nasal**	**L Zyg**	**R Zyg**
Present	Present	Present		Present	Present	Present	Present

Skull						
L Frontal	**R Frontal**	**L Parietal**	**R Parietal**	**L Temporal**	**R Temporal**	**Supraoccipital**
		Present	Present	Present	Present	Present

Skull					
Exoccipital	**Basioccipital**	**L Sphenoid**	**R Sphenoid**	**Basisphenoid**	**Hyoid**
Present	Present			Present	

Catalogue of Data from the *London Coroners' Rolls*

Part 1: Basic Information

Context Number	Year	Month of Inquiry	Day of Inquiry	Month of Death	Day of Death	Month of Attack	Day of Attack	Day of the Week	Time of Day	Victim Sex	Perpetrator Sex
1	1300	October	13	October	11	NA	NA	NA	NA	Male	NA
2	1300	October	31	October	30	October	28	Friday	Dusk	Female	Male
3	1300	December	2	December	1	December	1	Thursday	Vespers	Male	Male
4	1300	December	24	December	16	December	16	Friday	NA	Female	Male
5	1300	November	15	November	14	November	13	Sunday	Before the hour of curfew	Male	Male
6	1300	December	11	NA	NA	NA	NA	NA	NA	Female	Male
7	1300	December	4	December	4	December	3	Saturday	After the hour of curfew	Male	Male
8	1300-1	January	27	January	26	January	12	Thursday	After the hour of curfew	Male	Male
9	1300-1	March	13	March	6	March	6	Monday	Vespers	Male	Male
10	1301?	November	21	November	20	November	20	Sunday	Twilight	Female	Male
11	1301	September	1	August	30	August	30	Wednesday	After the hour of Vespers	Male	Male

12	1301	August	8	August	7	July	23	Sunday	Vespers	Male	Males
13	1301	April	21	April	20	April	20	Thursday	Growing dark	Male	Male
14	1301	June	7	May	31	April	7	Thursday	After the hour of curfew	Female	Males
15	1301	August	3	July	31	July	13	Thursday	After the hour of curfew	Male	Males
16	1321	December	23	December	21	December	5	Saturday	At dusk	Male	Male
17	1321	November	30	November	29	November	29	Sunday	After the hour of curfew	Male	Male
18	1321	November	30	November	29	November	8	Sunday	After the hour of curfew	Male	Males
19	1321	October	23	October	23	October	18	Sunday	After the hour of curfew	Male	Male
20	1321	October	20	October	20	October	19	Monday	After the hour of Vespers	Male	Male
21	1321-2	January	3	January	2	December	7	Monday	Vespers	Male	Male
22	1321-2	February	9	February	9	February	2	Tuesday	Midnight	Male	Male
23	1321-2	March	15	March	14	March	14	Sunday	At dusk	Male	Male
24	1321-2	January	12	January	10?	January	4	Monday	Before midnight	Male	Males

25	1322	July	30	July	29	July	15	Thursday	Hour of curfew	Male	Male
26	1322	September	27	September	19	September	19	Sunday	Hour of curfew	Female	Male and Female
27	1322	May	18	May	17	May	17	Monday	Sunset	Male	Male
28	1322	May	2	May	2	April	30	Friday	Hour of Prime	Male	Male
29	1322	April	26	April	26	April	25	Sunday	Vespers	Male	Males
30	1322	July	19	December	24	December	24	Thursday	NA	Male	Male
31	1322	July	12	July	11	July	9	Friday	After the hour of curfew	Male	Male
32	1323	December	21	December	20	December	19	Monday	After the hour of curfew	Male	Male
33	1323	September	30	September	28	September	19	Monday	After the hour of curfew	Male	Males
34	1323	October	27	October	26	October	26	Wednesday	Little before midnight	Male	Male and Female
35	1323	December	1	November	30	November	30	Wednesday	Before the hour of curfew	Male	Male
36	1323	November	12	November	11	November	11	Friday	At dusk	Male	Male
37	1323-4	February	10	February	10	February	9	Thursday	At dusk	Male	Males
38	1323-4	February	3	February	3	February	3	Friday	NA	Male	Male

39	1323-4	March	10	NA	NA	October	2	Sunday	NA	Female	Male
40	1324	October	7	October	5?	August	8	Wednesday	NA	Male	Males
41	1324	June	11	June	11	June	11	Monday	Break of day	Male	Males
42	1324	June	10	June	9	June	9	Saturday	After the hour of curfew	Male	Male and Female
43	1324	October	17	October	16	October	16	Tuesday	Vespers	Male	Male
44	1324	March	26	March	25	March	25	Sunday	At dusk	Male	Male
45	1324	November	7	November	7	November	4	Sunday	At dusk	Male	Males and Female
46	1324	May	9	May	3	May	3	Thursday	After the hour of Vespers	Male	Male
47	1324	October	30	October	29	October	22	Monday	Before the hour of curfew	Male	Male
48	1324	May	25	May	24	May	24	Thursday	NA	Male	Male
49	1324	November	13	November	12	November	12	Monday	At dusk	Male	Male
50	1324	August	5	July	21	July	17	Tuesday	At dusk	Male	Male
51	1324	May	3	April	30	April	30	Monday	Vespers	Male child	Female
52	1324	October	6	October	5	October	5	Friday	Vespers	Male	Male
53	1324	November	15	November	15	November	15	Thursday	NA	Male	Male

54	1324	June	11	NA	NA	September	10 (1320)	Wednesday	NA	Male	Male
55	1324	September	9	September	8	September	8	Sunday	Vespers	Male	Male
56	1324	July	18	July	18	July	11	Wednesday	Hour of Compline	Male	Male
57	1324	November	12	November	12	November	12	Monday	Midday	Male	Male
58	1324	December	3	November	24?	November	19	Monday	At dusk	Male	Male
59	1324-5	January	20	January	18	January	18	Friday	At dusk	Male	Male
60	1324-5	January	24	January	23	January	23	Wednesday	At dusk	Male	Males
61	1324-5	January	22	January	21	January	21	Monday	Midday	Male	Male
62	1324-5	February	26	NA	NA	June	24 (1321)	Thursday	NA	Male	Male
63	1324-5	March	15	NA	NA	NA	NA	NA	NA	Male	NA
64	1325	March	26	March	25	March	25	Monday	Night	Male	Male
65	1325	December	22	November	21	November	21	Saturday	Vespers	Male	Male
66	1325	July	16	July	16	July	16	Tuesday	Vespers	Male	Male
67	1325	March	27	March	25	March	24	Sunday	Hour of Compline	Male	Male
68	1325	August	12	August	12	August	9	Friday	Night	Male	Male
69	1325	April	22	April	21	April	21	Sunday	Vespers	Male	Male?
70	1325	March	18	March	17	March	17	Sunday	Hour of Compline	Male	Males
71	1325	April	8	April	7	March	24	Sunday	Vespers	Male	Male

72	1325	November	15	November	14	November	10	Sunday	After the hour of curfew	Male	Males
73	1325	June	4	June	4	June	4	Tuesday	Midday	Male	Males and Females
74	1325	March	27	March	17?	March	17?	Sunday	At dusk	Female	Male
75	1325	November	17	November	16	November	10	Sunday	NA	Male	Male
76	1325	June	27	NA	NA	December	Around 25 (1322)	NA	NA	Male	Males
77	1325	November	24	November	23	November	20	Wednesday	After the hour of curfew	Male	Male
78	1325	April	3	March	26	March	24	Sunday	NA	Male	Male
79	1325-6	February	25	February	25	February	23	Sunday	Hour of Compline	Male	Males
80	1325-6	March	2	March	1	March	1	Saturday	At dusk	Male	Male
81	1325-6	February	20	February	19	February	19	Wednesday	Hour of curfew	Male	Male
82	1325-6	February	18	February	17	February	13	Thursday	At dusk	Male	Male and Female
83	1325-6	February	16	February	15	February	9	Sunday	After the hour of curfew	Male	Male
84	1325-6	February	3	February	2	February	2	Sunday	Hour of curfew	Male	Male

85	1325-6	January	7	January	6	December	30	Monday	Vespers	Male	Male
86	1325-6	January	27	January	26	January	26	Sunday	Hour of curfew	Male	Males and Female
87	1326	June	22	June	21	June	8	Sunday	Hour of curfew	Male	Males
88	1326	September	10	September	9	September	8	Monday	Midnight	Female	Male
89	1326	July	9	July	8	June	28	Saturday	After the hour of curfew	Male	Female and Males
90	1326	June	25	June	25	June	25	Wednesday	Vespers	Male	Male
91	1326	July	12	July	18?	June	24	Tuesday	Break of day	Male	Male
92	1326	August	22	August	22	August	21	Thursday	Little before sunset	Male	Male
93	1326	April	14	April	13	April	13	Sunday	Hour of curfew	Male	Male
94	1326	August	22	August	22	August	22	Friday	Hour of Prime	Male	Males
95	1326	May	19	May	18	May	18	Sunday	At dusk	Male	Male
96	1326	July	4	NA	NA	June	3 (1325)	Monday	NA	Male	Male
97	1326	August	2	August	1	June	23	Monday	NA	Female	Female
98	1326	June	10	June	9	June	8	Sunday	About sunset	Male	Males
99	1336	October	30	October	29	October	25	Friday	After curfew	Male	Female

100	1336	June	25	June	24	June	24	Monday	Hour of curfew	Male	Male
101	1336	November	12	November	12	October	14	Monday	After dinner	Male	Male
102	1336	November	11	November	10	November	10	Sunday	NA	Male	Male
103	1336-7	February	19	February	18	February	16	Sunday	After the hour of curfew	Male	Males
104	1336-7	February	28	February	27	February	27	Thursday	After the hour of curfew	Male	Male
105	1336-7	February	12	January	22?	January	20	Monday	After the hour of curfew	Female	Male
106	1337	May	22	May	22	April	26	Saturday	After the hour of Vespers	Male	Male
107	1337	May	5	February	27	February	27	Thursday	After the hour of curfew	Male	Male
108	1337	July	25	July	24	July	23	Wednesday	Midnight	Male	Males
109	1337	May	3	May	2	May	2	Friday	After the hour of Vespers	Male	Males and Female
110	1337	July	27	July	26	July	26	Saturday	At dusk	Male	Male
111	1337	September	19	NA	NA	May	21	Thursday	NA	Male	Male
112	1337	September	19	NA	NA	May?	21?	Thursday	NA	Male	Male

113	1337	September	17	September	16	September	16	Tuesday	Midnight	Female	Male and Female
114	1337	June	9	June	8	June	8	Sunday	Vespers	Male	Male
115	1337	April	26	April	21	April	21	Monday	After the hour of Vespers	Male	Male
116	1338	November	7	November	6	November	6	Friday	Hour of curfew	Male	Male
117	1338-9	March	20	NA	NA	March	19	Friday	At dusk	Male	NA
118	1338-9	March	20	March	19	January	24	Sunday	Hour of curfew	Male	Male
119	1338-9	March	11	March	10	February	21	Sunday	Midnight	Male	Male
120	1338-9	March	11	March	10	March	7	Sunday	At dusk	Male	Male
121	1338-9	February	15	February	14	February	14	Sunday	At dusk	Female	Male
122	1339	November	1	October	31	October	31	Sunday	Hour of curfew	Male	Males
123	*1339*	September	30	September	29	September	29	Wednesday	Sunset	Male	Male
124	1339	November	30	November	29	November	6	Saturday	After the hour of curfew	Male	Male
125	1339	August	3	August	2	August	2	Monday	After sunset	Males	Males and Female
126	1339	May	23	May	22	May	22	Saturday	After the hour of Vespers	Male	Males and Female
127	1339	July	28	July	28	July	17	Saturday	Vespers	Male	Males

128	1339	June	22	June	21	June	21	Monday	Vespers	Male	Male
129	1339	August	9	August	8	August	8	Sunday	After the hour of Vespers	Male	Male
130	1339	June	15	June	14	June	14	Monday	Sunset	Male	Male
131	1339	June	22	June	21 (for John) and 22 (for Thomas)	June	20	Sunday	After the hour of curfew	Males	Males
132	1339	May	12	May	12	May	9	Sunday	Midnight	Male	Male
133	1339	August	25	August	24	August	23	Monday	Hour of curfew	Male	Male child
134	1339	March	30	March	29	March	25	Thursday	Vespers	Male	Male
135	1339	October	5	October	4	October	4	Monday	Vespers	Male	Male
136	1339	December	20	December	19	December	19	Sunday	After the hour of curfew	Male	Male
137	1339	November	14	November	13	November	13	Saturday	After the hour of curfew	Male	Male
138	1339	June	19	June	12	June	12	Saturday	Little after the hour of curfew	Male	Male
139	1339	April	26	April	25	April	25	Sunday	Vespers	Male	Male

140	1339	June or July	NA	June or July	Friday after	June or July	June 22-July 28	Sunday	Hour of curfew	Male	Male
141	1339-40	March	21	NA	NA	March	12	Sunday	NA	Male	NA
142	1339-40	February	25?	February	25	February	19	Saturday	At dusk	Male	Males?
143	1339-40	January	14	January	14	January	9	Sunday	After the hour of curfew	Male	Male
144	1340	July	14	July	14	July	3	Monday	Third hour	Male	Male
145	1340	June	1?	May?	31?	May?	31?	Wednesday	Vespers	Male	Males and Female
146	1340	May	8	May	7	May	7	Sunday	Sunset	Male	Male
147	1340	July	22	July	21	July	9	Sunday	After the hour of curfew	Male	Males
148	1340	August	28	August	2	August	2	Wednesday	After dinner	Male	Males
149	1340	July	26	July	25	May	16	Tuesday	Vespers	Male	Males
150	1340	June	1	May	31	May	21	Sunday	At dusk	Male	Male
151	1340	September	11	September	11	July	23	Sunday	At dusk	Male	Male

152	1340	July	7	NA	NA	May	31 (1332)	Sunday	NA	Male	Male
153	1340	August	26	August	25	August	25	Friday	Vespers	Male	Male
154	1340	September	11	September	11	August	28	Monday	Hour of curfew	Male	Males

Part 2: Detailed Information

Context Number	Weapon	Location of Wound	Motive	Ward	Parish	Deodand
1	NA	NA	NA	Billingsgate	St Mary at Hill	None
2	Foot	Kick to the stomach	Stepped into a fight between Reymund and her husband over a coat	Cordwanerstrete	St Mary de Aldermarichirche	Chattels of Reymund and Magot = 30s
3	Irish knife	Left breast (wound: 1 in. long and penetrating through the body)	Argument due to "former rancour and abuse"	Cordwanerstrete? (ward of Thomas Romeyn)	Holy Trinity the less	Chattels of Robert and John = 65s.

4	None	"Compelled" to drown herself after being chased	NA	Portsoken	St Botolph	None
5	Dagger	Right breast (wound: 1 in. long and 2 in. deep)	Argument over a tunic stolen from him	Portsoken	St Botolph	Chattels of John = 9s. 6d.
6	NA	NA	NA	NA	NA	Chattels of William = 2s.
7	Piece of wood	Left side of head (wound: 2.5 in. long and penetrating to brain)	Argument of whether Hervey had removed a "forcer" (strongbox) from the house	Vintry	St James de Garlekhuthe	Chattels of John = 6s. 7d.
8	Balstaf (quarterstaff)	Left side of head (wound: 1 in. long and 1 in. deep) and right side of head (1 in. long and 1 in. deep)	Harassing Thomas because he reprimanded him and William Osbern for trying to steal apples	Douegate	St Laurence de Kandelwykstrate (St Laurence Poultney)	Thomas had no chattels in London
9	Dagger	Left side of chest, under the breast (wound: 1 in. long and 3 in. deep)	Joice's chequers partner, Thomas de Bristoll, took offense to Robert and his gang and started a fight	Walebrok	St Mary de Bothawe	Robert and his gang had no chattels
10	Irish knife	Right shoulder blade (wound: 1 in. long and 6 in. deep)	Refused to spend the night with the perpetrator	Walebrok	St Mary de Wolcherchehawe	None

11	Dagger	Under the shoulder (wound: 1 in. long and .5 in broad, penetrating to the heart)	Trying to "avenge" the honor of Elena Hellebole	Cripplegate	St Alban	Chattels = 29s. 3d.
12	Sticks	All over the body	Thought to be a robber	Farringdon	NA	None
13	Anelace	Right side of body (wound: 1 in. long and 4 in. deep, reaching to heart)	Argument of unknown origin	Farringdon within	St Mary le Quern	Henry had no chattels
14	Fists	Beaten and early childbirth	Stepped into a premediated assault on her husband	Farringdon without	St Sepulchre without Newgate	John and Augustine had no chattels
15	Balstaf (quarterstaff)	Right arm and the body between the shoulders	Struck one of Philip's dogs for fighting, Philip took offense and Touse beat him	Langebourne	NA	Chattels = £107 10s. 4d.
16	Sword	Cut off left hand	Argument of unknown origin	Cordwanerstrete	All Hallows de Bredstrete	John had no chattels
17	Sword, called a "fauchon"	Left side of breast (wound: 1 in. long and 5.5 in. deep)	Argument (over a game called "hasard"?)	Langebourne	St Mary Wolnoth	John had no chattels
18	Sticks, called oars	Forehead (wound: 2 in. long and penetrating to the brain_	"Malice prepense"	Portsoken	St Botolph	William and Ralph had no chattels
19	Small knife	Right side (wound: 1 in. long and 4 in. deep)	Argument of unknown origin	Tower	St Dunstan	Richard had no chattels

20	Sword	Right side (wound: 2 in. long and 5 in. deep)	Telling Thomas to ride his horse more carefully after he almost ran over a woman carrying a child	Vintry	St Martin	Thomas only owned the horse which he fled on
21	Staff, called "pollex"	Forehead (wound: 1 in. long and penetrating to the brain	Philip punched William after he dumped his urine on a young man's shoe	Bishopsgate	St Mary without Bishopsgate	William had no chattels
22	Balstaf (quarterstaff)	Left side of head (whole head)	William hit Reginald for calling him onto the street after William implored them to stop shouting in the street and let people sleep	Bradstrete	St Peter de Bradstrete	Two small pigs = 3s, one "shippingbord" = 3d., one broken chest and a table = 6d., one pair of worn linen sheeps = 4d., a blanket and a worn linen cloth and other small things at 2s. 9.5d. Total = 6s. 11.5d
23	Knife, called a "fauchon"	Under his left ear (wound: 1 in. long and 2 in. deep)	Argument of unknown origin	Langebourne	All Hallows de Graschirche	Alexander had no chattels

24	Sword, Irish knife and balstaf	Sword = 3 wounds to the back of the head and one on the left side (each wound: 2 in. long and penetrating the skull, and one under his left ear (wound: 2 in. long and 1.5 in. deep); balstaf = sides, back, arms, and neck	For killing John's brother, Osbert le Pledour	Langebourne	St Clement de Candelwykstrete	John and companions had no chattels
25	Iron staff	On the head over the left ear (wound: 3 in. long and 5 in. deep)	For trying to stop John Pentyn from hanging himself	Aldersgate	St Mary de Stranynglane	None
26	Balstaf (quarterstaff)	Top of the head (wound: crushed the whole of her head)	Lucy went to spend the night at the shop like she often did but this time she was wearing good clothes and Richard and Cristina killed her for them	Alegate	St Olave	Richard and Cristina had no chattels that they didn't take away with them

27	Knife, called "twytel"	Under the left breast (wound: 1 in. long and 2 in. deep	Robert beat John Pope's wife, Amicia, with a "distaf" because of an old quarrel, when John tried to stop him, Robert ran after him with the intention of beating him as well; John stabbed in self defense	Bredstrete	St Dunstan	Chattels = 6d.
28	Knife, called "twytel"	Belly, under the navel (wound: .5 in. long and 1 in. deep)	Tied John up to rob him of all the goods in his possession	Cornhull	St Michael	Groom did not appear to have chattels
29	"Quart" (wooden measure) and fists	Top of his head (wound: 2 in. long and reaching to the skull - apparently not mortal); thrown down the stairs of a solar injuring his neck and shoulders	Argument of unknown origin	Lymstrete	St Peter de Cornhull	John and William had no chattels; quart = .5 penny, stairs = 2p
30	NA	NA	NA	None	None	None
31	Staff, called "gysarme"	Top of the head (wound: 6 in. long and penetrating the brain	"Malice presense"	Walebrok	St Stephen de Walebroke	"Hakeneye" and two paniers = 2s

32	Knife, called "trancheour"	Belly under the navel (wounds: 1in. long and 4in. deep)	Stephen won money off of Arcus in a game of tables, Arcus then led Stephen to the gate of the church of St Magnus where he killed him with "malice aforethought"	Billingsgate	St Bartholomew (clerical error for St Botolph?)	Arcus had no chattels
33	Staff, called "sparth"	Right hand (wound: 4 in. long and penetrating the middle of the hand)	Argument of unknown origin	Bradstrete	Little St Bartholomew	Roger had no chattels; Reginald: blanket, a long cloak, and two worn sheets = 14p, a chest with half a bushel of beans = 7p, total = 21p; Staff, called "sparth", and knife, called "bideu" = 3p
34	Axe, called "belte"	Back of his head (crushed the whole of his head to the brain), then burned the body	John, William, and Johanna entered the hostel in order to steel goods from it but John got cold feet so William asked John to go light a fire and while he was on his knees by the fire William and Johanna killed him	Bredstrete	St Mildred	William and Johanna had no chattels

35	Knife, called "trancheour"	Under the left breast (1 in. long and .5 in. deep)	Argument of unknown origin	Cheap	St Laurence	Chattels: brass pot, brass pan, and iron pan = 18d., a blanket, a long cloak, and two old sheets = 12d., piece of ox leather = 10d., chest = 4d., other utensils = 6d., twelve pair of shoes of bazen (inferior kind of leather made of sheepskin) = 4s. 6d.; Total = 8s. 8d.

36	Knife, called "trancheour"	Under the left breast (wound: 1 in. long and 7 in. deep	"Malice aforethought" because Thomas had cited John to the Chaplain	Langebourne	St Dionis Bakcherche	Chattels: brass bowl and pot = 2s. 6d., three old pans = 15d., a basin and ewer = 16d., a pitcher of tin = 6d., five small dishes = 3s. 6d., four towels = 2s. 4d., one shirt = 4d., three old sheets = 18d., three blankets = 4s., two silver rings = 2d., three razors and a pair of foreceps = 6d., coffer = 8d, cash = 7d, a chair and buffet = 9d.; Total 19s. 11d.
37	Balstaf (quarterstaff)	Right side of head (skull broken into the brain)	Gerard came to the assistance of Roger, cook of the Archdeacon of Winchester, who was trying to bring Agnes, the wife of Guy "Fulberd" to the Archdeacon, after he was kicked out of the house of Robert de Holewell where they were all eating dinner	Langebourne	St Edmund the King	John, Guy, William and Peter had no chattels. Robert had an old gown = 18d.
38	Knife, called "trancheour"	NA	NA	NA	NA	William had no chattels

39	Staff, called "fagotstaf"	NA	NA	NA	NA	Robert had no chattels
40	Pollax and balstafs	Head, back, and around the knees and thighs	"Malice aforethought"	Aldersgate	St Botolph within Aldersgate	They had no chattels
41	Fists and Irish knife	Whole body and under the right breast (penetrating to the belly; wound: 1 in. long and halfway through the body)	All the men beat Nicholas and William stabbed him for reason unknown	Bishopsgate	St Botolph de Bishopsgate	William de la Marche: sur-coat = 2s

42	Knife	Belly	John killed Edmund, with malice aforethought, for "lying with" Juliana	Bishopsgate	St Helen	Chattels: canvas = 3p, carpet de rino = 16p, coverlet of serge = 20p, coverlet of "Wirstede" = 20p, two old blankets = 14p, six sheets = 26p, one tablecloth and two towels = 20p, two chemises and a towel = 7p, gown of green cloth = 5s, gown of blue cloth = 4s, trunk of small things = 12p, piece of canvas and a "materaz" = 2s, a blanket = 12p, carpet = 10p, a "card" (an inferior piece of silk) and an ear-cushion = 6p, parcel of woollen thread = 2p, two brass pots = 4s, brass pan and a "costerell" (a drinking cup) = 12p, a dish and ewer and one andiron = 2s; Total = 32s

43	Knife, called "anelaz"	Left side of the belly (wound: 1 in. long and 5 in. deep)	"Existing rancour"	Bredstrete	St Peter	John had no chattels
44	Knife, called "twytel"	Under the left breast (wound: 1in. long and 6in. deep)	Argument of unknown origin in which Simon threatened and insulted William	Cheap	St Pancras	None
45	Sword	Left side of head (wound: 7 in. long and 3 in. deep)	NA	Cheap	St Pancras	William, Robert, and Cristina had no chattels
46	Knife	Breast (wound: 1 in. long and 4 in. deep)	Thomas de Lenne took offense to the minstrel playing in the house, chased after him with a staff (called a "dunbarre"), and hit him on the head. Thomas Somer stabbed him in self defense	Cornhull	St Michael	None
47	Balstaf (quarterstaff)	Right arm and left side of head	Attacking Simon with a misercorde	Cripplegate	St Alphege	Simon had no chattels
48	Knife, called "twytel"	Throat (wound: 1.5 in. long and 2 in. deep)	Argument of unknown origin, instigated while playing a game and drinking	Douegate	All Hallows at the Hay	John had no chattels
49	Knife, called "twytel"	Belly under the navel (wound: 1 in. long and 5 in. deep)	Argument of unknown origin	Douegate	All Hallows at the Hay	Robert had no chattels

50	Sword	Right side of head (wound: 5 in. long and 1 in. deep	Argument of unknown origin	Farringdon without	St Dunstan	None
51	Right hand	Struck him under his left ear	Chastising him for taking a parcel of wool and placing it under his cap	Farringdon without	St Sepulchre	None
52	Irish knife	Left breast (wound: 1 in. long and 5 in. deep)	John stabbed William for hitting Johanna de Lillebourne over an argument	Langebourne	St Mary Wolnoth	John had no chattels; knife = 2p
53	Knife, called "misericord"	NA	Robert, called "Litelrobyn", and Geoffrey, the cobbler, living near Grascherche, incited him to commit the murder	Langebourne	NA	John had no chattels
54	NA	NA	NA	None	None	John had no chattels
55	Knife, called "trancheour"	Under the left breast (to the heart)	Argument of unknown origin when Nicholas drew an anelaz and stabbed John 4 times in the throat and neck. He pursued John as far was the river when John turned around and stabbed him	Tower	All Hallows de Berkyngechurch	Nicholas had no chattels; John's chattels: sur-coat and a shirt = 6p

56	Knife, called "misericord"	Top of the head (wound: 5 in. long and penetrating the brain)	Nicholas Lightfot attacked Nicholas le Walsh with a sword in the parish of St Mildred in Poultry and struck him on the head. Nicholas le Walsh got up and fled to the church of St Benedict de Grascherche but was pursued by Nicholas and that's where Nicholas le Walsh stabbed him in self defense	Tower	NA	Nicholas had no chattels
57	Knife, called "trenchour"	Breast (wound: 1.5 in. long and penetrating to the heart)	John and Elysas (brothers) were working in the Tower when they fought and Elyas struck John with a staff, drop up on the Tower wall by the Thames with the intention of killing him. John stabbed him in self-defence	Tower	NA	John had no chattels
58	Knife, called "bideu"	Top of the head (wound: 3 in. long and penetrating the skull)	Argument of unknown origin	Vintry	St Michael de Paternostercherch	John had no chattels

59	Staff, called "fagotstaf"	Left side of head	Stephen heard William arguing with his wife, Margery, and drew his knife, "bideu", with the intention of killing William, his master, but William drew his staff and hit Stephen first	Bredstrete	St Wereberga (identical with the parish of St John the Evangelist)	Chattels: 100 horse-shoes without nails, and divers implements for work = 5s
60	Staff, called "Gisarme", and a knife	Staff: middle of the neck; Knife: chest and arm (3 wounds)	Argument of unknown origin	Castle Baynard	St Gregory	Both Johns had no chattels
61	Knife, called "anelaz"	Heart	Argument of unknown origin in the brewhouse of John "Scut"	Lymstrete	St Andrew upon Cornhull	Chattels: four geese = 12p, a little pig = 12p, wood = 12p, a cock and a hen = 4p, 100 flasks of beer = 5s, a box of dice = 6p, a quarter of brewing barley = 4s. Total = 12s. 10d.
62	NA	NA	NA	NA	NA	Chattels: red hakeney = 40p
63	NA	NA	NA	NA	NA	None

64	"Twybil"	Head and throat (5 wounds)	John and his mistress, Isabella, broke into the close of Richard de Rothinge, carpenter, and stole divers goods (an axe, a "twybil", a blanket, two sheets, and a basket with its contents), Richard's servant, killed John in the process of stopping him	Aldersgate	St Botolph	None
65	Knife, called "trancheour"	Left breast (wound (1 in. long and 4 in. deep)	Argument of unknown origin	Bishopsgate	St Alburga (Ethelburga)	Robert had no chattels
66	Knife, called "hirisshekynf"	Heart	Argument of unknown origin	Bredstrete	St Mildred	Walter had no chattels

67	Balstaf (quarterstaff)	Top of the head	Walter and 17 companions went to the brewhouse of Gilbert de Mordone with the intention of carrying off Emma, daughter of the late Robert Pourte and under the charge of Gilbert. Gilbert's wife, Mabel, and Geoffrey, the brewer of Gilbert, tried to get them to leave but they refused. They then assaulted Geoffrey and Robert de Mordone, hitting Robert on the head with a stone. Robert then raised the cry and fled into the High Street. Walter, with a knife in one hand and a misericord in the other pursued Robert when Benedict de Warde and other neighbors came to stop the situation. Walter assaulted Benedict with his weapons and refused to surrender when Benedict grabbed a stranger's staff and hit him	Bridge	St Michael	Benedict had no chattels

68	Arrow	Left side	Accidentally shot Robert while watching the Dean's crop in the fields of Stebenhuth, co. Middlesex, with him, William Deveneys, Robert le Cartere, Geoffrey le Clerk, John Harneys, and William de Bolingtone, servants of the Dean	Castle Baynard	St Gregory	William had no chattels
69	Knife, called "anelaz"	Left side of breast (1 in. long and 8 in. deep)	Quarreling when Thomas drove Joyce up the stone wall of Ydonia de Leyre and hit him on the face and drew his knife. Joyce drew his knife first and stabbed Thomas	Douegate	All Hallows on the Cellars (the Less)	None
70	Irish knife and misericorde	Irish knife: belly (through the middle of the body); Misericorde: head and left arm (2 wounds)	Argument of unknown origin	Farringdon within	St Peter de Wodestret	William had no chattels

71	Knife, called "misericord"	Head (wound: 3 in. long and reaching to the brain)	Gilbert, William le Perler, Richard Bokeskn, and Richard de Arderne, tailor went to the house of William Wynter to fight with him. William threw Gilbert to the ground. Richard went to strike William but hit Gilbert instead	Farringdon within	St Vedast	William and Richard had no chattels
72	Sword, axe, and staff	Sword (John de Wynestone): left side of head (wound: 7 in. long and 3 in. deep); axe (Thomas Walpol: nearly severing his leg; staff Martin de Aumbresbury)	Argument between the men of the mistery of Goldsmiths and that of Saddlers	Farringdon within	St Vedast	They had no chattels
73	Knife, called "bideu"	NA	NA	Farringdon within	NA	They had no chattels
74	Right hand	Under the left ear	Argument of unknown origin	Farringdon without	St Andrew	Ralph had no chattels

75	Sword	Forehead (wound: 4 in. long and 2.5 in. deep)	John de Oxon, clerk, at the request of William de Cornwelle, went to the tavern of Edmund Cosyn to assault John Wolfel, taverner, over an old quarrel. John de Glenham and other Bench apprentices came to help and that's when William le Taverner attacked John	Farringdon without	St Bride de Fleetstreet	None
76	NA	NA	NA	None	None	Chattels = tunic and hood = 16p, a sword and two knives = 4p. Total = 20p
77	Knife	Right arm (wound: .5 in long and penetring to the bone - Richard); breast (wound: 3 in. long and .5 in deep - Thomas)	Argument of unknown origin	Tower	All Hallows de Berkyngechurch	Richard and Thomas had no chattels
78	"Panade"	Top of the head (wound: 4.5 in long and penetrating the brain)	Argument of unknown origin	Walebrok	St Swithun	William had no chattels

79	Balstaffs	Top of the head (down to the brain)	An argument between Eustace le Keu, John le Ferrour, Thomas le Croudere, servants of Sir John de Feltone, and Peter de Seyntes, servant of Master William de Westone broke out when John's servants refused to hand over a horse they were transporting for William de Westone to his servant, Peter. William Maucovenaunt, brother of John le Keu, seeing the argument attacked Thomas with a fist. This scuffle caused John de Feltone, junior, to leave the house of Adam Draytone with his sword drawn and struck Thomas de Newentone, servant of Hugh de Depedene at the door of the house. William, John, and Geoffrey then proceeded to attack John de Feltone junior	Bredstrete	All Hallows de Bredstrete	They had no chattels

80	Sword, called "misericord"	Right breast (wound: 1 in. long and 6 in. deep)	Argument of unknown origin	Candelwykstrete	St Mary de "Abbechirche"	None
81	Knife, called "twytel"	Heart	Argument of unknown origin	Castle Baynard	St Mary Magdalen	William had no chattels

82	Sword, called "misericord"	Navel (wound: 3 in. long and reaching the bowels)	Alan entered Walter's chamber where he saw Walter sitting with Alice, who was mistress to the both of them	Cheap	St Laurence Jewry	Alice had no chattels and Alan's chattels were in a chamber rented from Margery de Northamptone in the parish of St Martin de Oteswych: two small drinking cups called "Flagetz" = 4p, a pot and salt-cellar of "peautre" = 4p, an old bridle = 1 penny, two posnets = 20p, a broken mazer cup = 6p, a brass dish = 3 halfpence, a small cross-bow = 12p, a torn table-cloth and towel = 6p, a desk for books = 1 penny, a "materaz" = 10p, three pillows = 6p, a chest = 12p, a piece of pork and a piece of beef = 10p. Total = 10s. .5d.

83	Sword	Top of head (wound: 4 in. long and reaching the brain	Argument of unknown origin	Farringdon without	St Dunstan	Walter had no chattels
84	Long knife	Left breast (wound: 1.5 in. long and reaching the heart)	NA but happened after they left the house of Richard de Kent, "taillour" in the parish of St Peter de Cornhull in the ward of Lymstrete	Lymstrete	St Peter de Cornhull	None
85	"Shovele"	Head (wound: 7 in. long and reaching the brain)	NA	Vintry	St Martin	William had no chattels
86	Long and thin knife	Breast (wound: 1/3 in. long and reaching the heart	Unknown, but happened after they left the tavern of Henry Deumars in the ward of Langebourne - Nicholas and John carried the body to where it was found on High Street	Walebrok	St Swythun	None

87	Swords	Thomas de Walpol - left arm near the hand (wound: 3 in. long and .5 in. deep); William de "Stormouth" - back part of his head (wound: 1.5 in long and penetrating the brain) and right side (wound: 4 in. long and 2 in. deep)	Thomas and William were approaching Aldersgate with swords and bucklers drawn when Thomas de St Alban, thinking they were disturbers of the peace, rose and struck Thomas de Walpol to the ground with a staff	Aldersgate	St Agnes	They had no chattels
88	Pushed into a fire	Whole body	John blamed Alice for causing the candle to fall that started the fire as they were going to bed	Aldersgate	St Botolph within Aldersgate	None

89	Balstaffs	Back and sides; head and body	John and Agnes were quarreling when Agnes took the staff from John's hands and beat him with in. Geoffrey, Thomas, and Andrew then came and also beat him with staffs	Alegate	St Katherine within Alegate	Agnes's chattels: form = 3.5d, a "trestel" = 1d, a hand-mill = 2s.2d, a lead = 2s, fifty "fagotes" = 3s., wood for firing = 12s., a "fer-fork" at 1.5d, a piece of wood called "courbe" = 7d, an old "forser" (strongbox) = 4d, five vats = 16d, an empty jar for beer = 4d, five "kemlyns" (tubs for brewing) = 12d, a small brass pot = 18d, a small table cloth = 5d, a pound of wax = 5d, two small chests without locks = 2s, four old "quissins" (cushions) = 8d, four old pillows = 7.5d, two small chests = 20d, feathers for a couch at 12d., a "bussel" at 1.5d, Total =. 10d

90	Staff, called "shide"	Back of the head	Fighting for unknown reasons	Bishopsgate	All Hallows de Graschirche	None
91	Knife, called "panade (a large two-edged knife, a poniard), and a balstaff	Thomas Gysors: knife to the forehead (wound: 4 in. long and penetrating the brain), Matthew: balstaff to the back part of the head	Snuck into the close of Thomas de West, Kent to assault Walter due to a previous quarrel	Bradstrete	St Mildred in the Poultry	None
92	Long knife	Under the left breast (wound: 1.5 in. long and 5 in. deep)	Argument of unknown origin	Candelwykstrete	St Clement	Andrew had no chattels
93	Long knife	Left breast (wound: .5 in. long and 5.5 in. deep)	Argument of unknown origin; John apparently "secretly" drew his knife	Cordwanerstrete	St Mary de Bow	John had no chattels
94	Palm of hand, fists and foot	Richard - palm of hand to the left jaw; Simon = fists under the left ear and kicked him on the ground	For dropping eel skins on the street opposite the shops of Simon de Peckham and John de Keslyngbury. Roger got up and began walking towards Cheap but fell and immediately died	Cordwanerstrete	St Mary le Bow	Simon and Richard had no chattels
95	Long knife	Under the right breast (wound: 1 in. long and 5 in. deep)	Argument of unknown origin	Cripplegate	St Peter de Wodestret	George had no chattels

96	NA	NA	NA	None	None	William had no chattels
97	Fists and knees	Belly	Argument of unknown origin (3 weeks after the attack Lucy gave birth to an abortive child and died of the blows)	Portsoken	St Botolph without Alegate	None
98	Arrow	Left side of belly near the navel	Apprentice of the Bench of the counties of York and Norfolk, with swords drawn, were quarreling near Aldersgate so that bells were rung and a crowd assembled. David and accomplices then decided to shoot arrows out of the window of their master's house near St Martin le Grand	Walebrok	St Stephen	They had no chattels

99	Knife, called "trenchour"	Over the left breast (wound: 1.5 in. long and 3 in. deep)	Argument of unknown origin	Alegate	St Katherine Coleman	Chattels (found in the house Mabel le Shereman in the parish of St Benedict Fynk, in the Ward of Bredestrete): a small brass pot and "poscenet" = 3s. 6d, a serge for a bed = 6d, a small chest with trifling contents = 12d. Total = 5s
100	Irish knife	Left side (reaching to the heart)	Argument of unknown origin	Billingsgate	St Mary atte Hulle	Richard had no chattels
101	"Dorbarre"	Hand, side, and head	Simon wounded Robert, John's father, on the upper lip over a quarrel they were having, causing John to take the "dorbarre" and strike Simon	Cordwanerstrete	St Mary at Aldermarichirche	John had no chattels
102	Fist and staff, called "potent"	Fist - left side of head; struck with staff on the ground	Argument of unknown origin	Langebourne	St Edmund the King	None
103	Staves	Over the head	Previous Argument of unknown origin - stood waiting for him	Aldersgate	St Botolph without Aldersgate	None

104	Knife, called "trenchour"	Near the navel (wound: 2.5 in. long and reaching the bowels)	Argument of unknown origin	Castle Baynard	St Gregory	Geoffrey had no chattels
105	Long and broad knife, called "bydawe"	Over the leg	Robert mistook Margery for Cecila de Ware, "fruter", who he had had a previous quarrel with	Cripplegate	St Mary Magdalen de Melkestrete	None
106	Knife, called "baselard"	Left hand - severing a finger	NA	Aldersgate	St John Zakary	"Gyot" had no chattels
107	Knife	Near the navel (wound: 2.5 in. long and reaching the bowels)	NA	Castle Baynard	St Gregory	Thomas had no chattels
108	Balstaff and knife with a three-edged point	Balstaff (John) - head; knife (Simon) top of head	Came to William's chamber at night and enticed him to leave his bed and come with them, where they then attacked him	Cornhull	St Michel de Cornhull	None

109	Knife, called "anelaz"; knives, called "Longknives"	Anelaz (Hugh Lovel) - throat; longknives (Hugh de Colne and John le Strong) - belly	Ela persuaded them to kill John due to a previous quarrel. Husculph Nevil engaged him in conversation in Cheap opposite Bredestrete and then Hugh Lovel, Hugh de Colne, and John le Stronge met them in "Fastelane" (St Vedast Lane, otherwise Foster Lane) and attacked him secretly	Farringdon within	St Michel "atte Corne"	They had no chattels
110	Short knife	Neck (wound: 1.5 in. long and 6 in. deep	NA	Farringdon without	St Bride de Fleetstreet	None
111	NA	NA	NA	None	None	William had no chattels
112	NA	NA	NA	None	None	William had no chattels
113	Irish knife	Left breast and throat	Came into the house at night, killed Juliana, and stole a strong-box containing money and jewels of the value of 10 marks	Portsoken	St Botolph without Alegate	None
114	Long knife	Back (wound: 2 in. long and 5 in. deep)	John and fighting with his father, John Wymark	Queenhithe	St Michael	Richard had no chattels

115	Short knife	NA (wound: 1.5 in. long and 3 in. deep)	John Doget and John Brede, "lokyere" were fighting when John Wyot tried to pacify them. John Doget then stabbed John Wyot	Tower	All Hallows de Berkyngechurch	None
116	Knife, called "twytel"	Throat (wound: 1.5 in. long and 3 in. deep)	Argument while drinking in a brewhouse with William de Westcote and Hugh de Louthe, porters. William and Hugh left and Alan and John followed shortly afterward which is when John attacked	Tower	All Hallows de Berkyngechurch	John had no chattels
117	Arrow	Belly	NA	Cheap	All Hallows de Honilane	None
118	Knife, called "bideu"	Under the left arm (wound: 1 in. long and 1.5 in. deep)	NA	Cheap	St Mary de Colchirche	None
119	Sword	Right side of head (wound: 3 in. long and 1 in. deep)	Argument of unknown origin	Cripplegate	St Peter de Wodestret	Richard had no chattels
120	Knife, called "anelaz"	Belly near the navel (penetrating the intestines)	Argument of unknown origin	Douegate	St Michel, called Paternostercherch	None

121	Knife, called "trenchour"	Side under the right arm (wound: 5 in. deep)	Geoffrey came to the rent where Alice was living intending to find Emma de Brakkele, a harlot, who he wanted to lie with. Failing to find her, an argument broke out between Geoffrey and Alice causing Geoffrey to secretly draw his knife and stab her	Farringdon without	St Andrew de Holbourne	Geoffrey had no chattels
122	Long knives	NA	Lied in wait to kill him for unknown reasons	Aldersgate	St John Zakary	John and Henry had no chattels; Nicholas's chattels: 6 wooden saddles, without apparel, and pieces of leather = 8s.
123	Short knife	Left side of breast (wound: 1 in. long and 4 in. deep)	Argument of unknown origin	Alegate	All Hallows de Stanyngcherche	William had no chattels
124	Long and thin knife	Right side of the neck (wound: 1 in. long and 7. in deep_	Argument of unknown origin	Bradstrete	St Martin de Oteswyche	None

125	Knife, called "trenchour" (John de Doure) and a long, thin knife (Nicholas Doure)	"Trenchour" - left side; long, thin knife - throat	NA; John killed Stephen and Nicholas killed William	Bridge	St Benedict de Grassecherche	None
126	Knives, called "bydawe" and "twytel"	"Bydawe" - left arm (wound: 2 in. long and penetrating the bone), "twytel" (Roger le Brewere) - left breast (wound: 1 in long and 7 in. deep)	Argument between Roger and Elena	Bridge	St Magnus	None
127	Sword	Top of the head (wound: 6 in long and penetrating the brain)	John and Robert were seeking to kill him over a previous quarrel	Bridge	St Martin Orgar	Roger had no chattels; John's chattels: table = 2s, twelve old pairs of "bracys" = 2s, three chests and a coffer = 5s. 3d.; two folding tables, two chairs, and two forms = 2s. 6d. Total = 11s. 9d.

128	Knife, called "bideu"	Severed artery in the leg	Nicholas may have assaulted Thomas first and Thomas managed to stab him as he was escaping - but written in a confusing manner	Castle Baynard	St Benedict	None
129	Short knife	Through the middle of the arm	Argument of unknown origin; Richard pursued him as far was the church where he then died	Cornhull	St Michael	None
130	Short knife	Breast (wound: 1 in. long and 4 in. deep)	NA	Cripplegate	St Mary de Aldermanbury	None
131	Swords and balstaffs	NA	NA	Farringdon without	St Andrew de Holbourne	None
132	Knife, called "twytel"	Breast (wound: 1 in. long and 4 in. deep)	Argument of unknown origin	Farringdon without	St Bride	"Paskes" had no chattels
133	Knife, called "bydawe"	Near the navel	The boy came to the brewhouse and stole a woman's hood worth 9d. William followed the boy in order to recover the hood but they boy stabbed him	Farringdon without	St Dunstan	None
134	Long knife	Back (wound: 2 in. long and 7 in. deep)	NA	Farringdon without	St Dunstan	John had no chattels
135	Long knife	Various wounds	A previous Argument of unknown origin	Portsoken	St Botolph without Alegate	None

136	Staff, called "wombedstaf"	Neck so that she fell down the stairs and broke her neck; her stepson, Robert junior also hit her on the hand	Argument of unknown origin	Queenhithe	St Michael	Chattels of the father: an old "curtepy" and coat of green cloth for a woman = 2s. 6d., two old coats = 18d., a brass pot = 3s., an old blanket = 20d., a sur-coat for a man = 12d. An old sur-coat for a woman = 2s, a piece of fur = 12d, an old chest = 4d., a staff called wombedstaff" = 1d., firewood and a barrel = 12d., a chest = 16d. Total = 15s. 5d.
137	Knife, called "bydawe"	Throat (wound: 1.5 in. long and 3 in. deep)	Argument of unknown origin	Suburb of London	St Botolph without Bishopsgate	Chattels: 3 vats, 5 small barrels and 4 kemelins = 10s, divers pieces of wood and wooden bands for binding vats, two small old chests without locks = 10s. 3d. Total = 20s. 3d.

138	Short knife	Right side of breast (wound: 1.5 in. long and 10 in. deep)	Argument of unknown origin	Tower	All Hallows de Berkyngechurch	Nicholas had no chattels
139	Knife, called "twytel"	Belly near the navel	NA	Tower	St Dunstan	Chattels: cash = 30s, gown and hood = 16d, six small hams = 6s, two florins = 7s 6d, Total = 44s. 10d.
140	Staff, called "Pykedstaffe"	Right side of head	Argument of unknown origin	NA	NA	William had no chattels
141	NA	Head (wound: 5 in. long and penetrating the brain)	NA	Farringdon without	St Andrew de Holbourne	None
142	NA	16 wounds on NA location	During a robbery	Langebourne	St Mary de Wolnoth	None
143	Knife with a triangular point	Left breast (wound: 1.5 in. long and 4 in. deep)	A previous argument of unknown origin	Portsoken	St Botolph without Alegate	None
144	Short knife	2 wounds: left arm and under the left breast	At the instigation of Robert de Wyleby, Kent, of co. Northampton	Aldersgate	St Mary de Stanynglane	John had no chattels

145	Long knife and sword	John de Bury with a long knife to the left side of the belly (2 wounds); Adam with a sword to the forehead, penetrating the brain	NA; Agnes held Geoffrey during the attack	Bishopsgate	St Botolph without Bishopsgate	None
146	Knife, called "twytel"	Right breast (wound: 1 in. long and 5 in. deep)	Argument of unknown origin	Bradstrete	St Christopher	None
147	Balstaffs and knife, called "bydawe"	William Aleyn with a balstaff over the head (brought him to the ground); Richard Polliscroft with a knife to the back (wound: 1.5 in. broad and 4 in. deep); John Lewe, Adam de Stevyntone, John atte Wolde and Robert Davy struck him on all parts of the body with balstaffs	Previous argument of unknown origin	Bradstrete	St Martin de Oteswyche	They had no chattels

148	Polax (1st inquest says the same; 2nd inquest says a "sparth")	Back of the head (penetrating the brain?)	1st inquest (only inquest to give motive): John de Oxon assaulted Nicholas le Leche, "pessoner" on account of an old quarrel. Ralph Turk, Robert Halpeny, and Simon Haunsard, fishmongers, came to the aid of Nicholas while John de Cornubia and others came to the aid of John. 1st and 3rd inquests say John de Cornubia then struck Ralph with a polax.	Bridge	St Magnus	They had no chattels
149	Swords	Head and back, and nearly severing his left hand	Assaulted him with swords drawn for reasons unknown	Cripplegate without	St Giles	They had no chattels
150	Long knife	Back	Dysery assaulted Wardeyn who then fled but was pursued which is when Dysery stabbed Wardeyn in the back	Farringdon without	St Andrew de Holbourne	None

151	Knife, called "baselard"	Left side of the head (wound: 4 in. long and penetrating to the bone)	Nicholas assaulted Roger in the High Street causing Roger to draw his knife and strike Nicholas. Nicholas then withdrew and on Sunday, August 6 Nicholas assaulted John, son of John atte Pyry, at whose suit Nicholas was seized and carried to Newgate where he then died of his wound	Neighbourhood of Newgate	NA	None
152	Knife	NA	NA	None	None	John had no chattels
153	Short knife	Throat (1 in. long and 4 in. deep)	An argument that had arisen between them in the Tower the same day; John drew his knife first and stabbed Peter with a long knife in 3 places	Tower	All Hallows de Berkyngechurch	Peter had no chattels

154	Swords	Many places	Assaulted him with swords drawn for reasons unknown	Walebrok	St Swythin	Chattels of Godekin: a "dun" horse = 13s. 4d., a white horse = 10s, a gown of russet = 9d., two small gowns of ray, much worn = 14d., an old cloak = 3d., an old helm with two "braceres" = 12d., a small chest and a knife = 9d. Total = 27s.3d.

Catalogue of Skeletons

Site Code	Context #	Year	Sex	Age	Fracture	# of Fractures	Location	Type of Trauma	Degree of Healing
GPO75	5001	1000-1200	F?	NA	0	0			
GPO75	5002	1000-1200	M	36-45	0	0			
GPO75	5003	1000-1200	M?	26-35	0	0			
GPO75	5004	1000-1200	NA	26-35	0	0			
GPO75	5005	1000-1200	NA	36-45	0	0			
GPO75	5006	1000-1200	NA	26-35	0	0			
GPO75	5008	1000-1200	NA	26-35	0	0			
GPO75	5009	1000-1200	M?	>45	0	0			
GPO75	5012	1000-1200	M	36-45	0	0			
GPO75	5013	1000-1200	NA	NA	1	1	L Fibula (lateral malleolus)	Comminuted	Antemortem
GPO75	5014	1000-1200	SA	12-17	0	0			
GPO75	5014.1	1000-1200	SA	1-5	0	0			
GPO75	5019	1000-	SA	SA	0	0			

		1200							
GPO75	5021	1000-1200	NA	NA	0	0			
GPO75	5022	1000-1200	M	26-35	0	0			
GPO75	5023	1000-1200	F?	NA	0	0			
GPO75	5027	1000-1200	M?	NA	0	0			
GPO75	5028	1000-1200	SA	6-11	0	0			
GPO75	5029	1000-1200	SA	1-5	0	0			
GPO75	5035	1000-1200	SA	6-11	0	0			
GPO75	5037	1000-1200	NA	36-45	0	0			
GPO75	5038	1000-1200	M?	36-45	1	3	T7-9	Avulsion	Antemortem
GPO75	5039	1000-1200	F	36-45	0	0			
GPO75	5040	1000-1200	NA	NA	1	1	R Humerus (proximal epiphysis and proximal third of diaphysis)	Epiphyseal Fracture of the Head and Possible Spiral Fracture of the Metaphysis (DD: Diaphyseal Aclasis	Antemortem
GPO75	5041	1000-	SA	1-5	0	0			

		1200							
GPO75	5042	1000-1200	M?	36-45	0	0			
GPO75	5043	1000-1200	SA	1-5	0	0			
GPO75	5047	1000-1200	M?	18-25	1	1	R Frontal	SFT	Perimortem
GPO75	5048	1000-1200	NA	26-35	1	1	L Maxillary M3 (lingual side)	Crown Fracture	Antemortem
GPO75	5050	1000-1200	F	26-35	0	0			
GPO75	5051	1000-1200	F?	>45	0	0			
GPO75	5052	1000-1200	F?	36-45	0	0			
GPO75	5053	1000-1200	F?	26-35	1	1	L Mandibular M2 (lingual side)	Crown Fracture	Antemortem
GPO75	5054	1000-1200	NA	NA	0	0			
GPO75	5056	1000-1200	SA	SA	0	0			
GPO75	5057	1000-1200	SA	SA	0	0			
GPO75	5058	1000-1200	SA	6-11	0	0			
GPO75	5059	1000-1200	F?	26-35	0	0			
GPO75	5062	1000-1200	SA	Perinatal	0	0			
GPO75	5063	1000-	F	36-45	1	1	L5	Avulsion	Antemortem

		1200							
GPO75	5064	1000-1200	F	36-45	0	0			
GPO75	5065	1000-1200	F?	26-35	0	0			
GPO75	5066	1000-1200	SA	1-5	0	0			
GPO75	5067	1000-1200	M	18-25	0	0			
GPO75	5068	1000-1200	M	18-25	1	1	L Patella (articular surface)	Avulsion?	Antemortem (in process)
GPO75	5070	1000-1200	M?	>45	0	0			
GPO75	5072	1000-1200	F?	>45	0	0			
GPO75	5073	1000-1200	F	36-45	1	1	L Calcaneus (anterior articular surface with talus)	Compression	Antemortem
GPO75	5074	1000-1200	F?	>45	0	0			
GPO75	5075	1000-1200	SA	1-5	0	0			
GPO75	5076	1000-1200	NA	NA	0	0			
GPO75	5078	1000-1200	NA	NA	0	0			
GPO75	5079	1000-1200	M?	36-45	1	1	L Upper rib (sternal end of shaft)	Transverse?	Antemortem
GPO75	5080	1000-1200	M?	36-45	0	0			

GPO75	5081	1000-1200	SA	12-17	0	0			
GPO75	5082	1000-1200	F	36-45	0	0			
GPO75	5083	1000-1200	F?	18-25	0	0			
GPO75	5084	1000-1200	F?	NA	0	0			
GPO75	5085	1000-1200	M	>45	1	1	L Humerus (lateral epicondyle)	Epiphyseal Avulsion	Antemortem
GPO75	5086	1000-1200	F	18-25	1	1	L 2nd MC (distal third)	Impaction	Antemortem
GPO75	5089	1000-1200	NA	36-45	0	0			
GPO75	5090	1000-1200	SA	1-5	0	0			
GPO75	5091	1000-1200	M?	26-35	1	1	R Humerus (medial epicondyle)	Epiphyseal Avulsion	Antemortem
GPO75	5092	1000-1200	M?	26-35	0	0			
GPO75	5093	1000-1200	M	26-35	1	1	R 5th MC (proximal third)	Impaction	Antemortem
GPO75	5094	1000-1200	NA	26-35	0	0			
GPO75	5095	1000-1200	SA	1-6m	0	0			
GPO75	5096	1000-1200	M	NA	1	1	R Parietal (coronal suture)	Puncture	Perimortem
GPO75	5097	1000-1200	NA	NA	0	0			

GPO75	5098	1000-1200	SA	6-11	0	0			
GPO75	5099	1000-1200	NA	18-25	0	0			
GPO75	5101	1000-1200	F	36-45	0	0			
GPO75	5102	1000-1200	F	36-45	0	0			
GPO75	5103	1000-1200	SA	1-5	0	0			
GPO75	5104	1000-1200	F?	26-35	0	0			
GPO75	5106	1000-1200	F	>45	0	0			
GPO75	5107	1000-1200	NA	NA	0	0			
GPO75	5108	1000-1200	Int	18-25	1	2	L1 and L4	Compression	Antemortem
GPO75	5109	1000-1200	F	18-25	0	0			
GPO75	5110	1000-1200	NA	NA	0	0			
GPO75	5111	1000-1200	SA	6-11	0	0			
GPO75	5112	1000-1200	M?	36-45	0	0			
GPO75	5115	1000-1200	NA	>45	1	2	T12 and L Maxillary I1	Burst and Crown Fracture	Antemortem
GPO75	5116	1000-1200	M	36-45	0	0			
GPO75	5117	1000-	NA	NA	0	0			

		1200							
GPO75	5118	1000-1200	M	36-45	1	3	C2, T11, and T12	Odontoid Avulsion and Compression	Antemortem
GPO75	5119	1000-1200	SA	1-5	0	0			
GPO75	5120	1000-1200	SA	12-17	0	0			
GPO75	5121	1000-1200	NA	NA	0	0			
GPO75	5122	1000-1200	F?	18-25	0	0			
GPO75	5123	1000-1200	SA	12-17	1	1	T5	Microfracture on Schmorl's Node	Antemortem
GPO75	5128	1000-1200	SA	1-5	0	0			
GPO75	5129	1000-1200	SA	1-5	0	0			
GPO75	5130	1000-1200	SA	7-11m	0	0			
GPO75	5131	1000-1200	M?	36-45	0	0			
GPO75	5133	1000-1200	NA	NA	1	2	R Parietal and R Scapula (scapular spine at the spinoglenoid notch)	Depression fracture, Avulsion fracture	Antemortem, Antemortem (in process)
GPO75	5134	1000-1200	F?	18-25	0	0			
GPO75	5135	1000-1200	NA	36-45	1	2	L3 and L4	Avulsion	Antemortem

GPO75	5136	1000-1200	SA	SA	0	0			
GPO75	5137	1000-1200	M?	36-45	0	0			
GPO75	5138	1000-1200	SA	SA	0	0			
GPO75	5139	1000-1200	NA	NA	0	0			
GPO75	5140	1000-1200	M?	36-45	0	0			
GPO75	5141	1000-1200	M?	>45	1	1	L Middle rib (mid-shaft)	Puncture	Perimortem
GPO75	5143	1000-1200	SA	1-5	0	0			
GPO75	5144	1000-1200	F?	26-35	0	0			
GPO75	5147	1000-1200	SA	12-17	1	1	L Parietal	Depression fracture (DD: Dermoid cyst)	Antemortem
GPO75	5148	1000-1200	M?	36-45	0	0			
GPO75	5149	1000-1200	F	36-45	0	0			
GPO75	5150	1000-1200	NA	>45	1	1	L Talus (Articular surface with fibula)	Crush?	Antemortem
GPO75	5151	1000-1200	F	36-45	0	0			
GPO75	5152	1000-1200	SA	12-17	0	0			
GPO75	5153	1000-	NA	NA	1	1	L Clavicle (lateral	Greenstick	Antemortem

		1200					third)		
GPO75	5154	1000-1200	M?	36-45	1	3	R Femur, L Humerus, and L3	Greenstick?, Spiral, and Microfracture	Antemortem
GPO75	5155	1000-1200	F	36-45	1	2	T10, L 4th Prox (head) and L 4th Int Hand Phalanx (base)	Microfracture, Intra-articular fractures	Antemortem
GPO75	5156	1000-1200	F?	36-45	1	1	L Prox Hand Phalanx (mid-shaft)	Oblique?	Antemortem
GPO75	5157	1000-1200	M	>45	1	2	T6 and R 1st MC (base)	Clay Shoveler's fracture, Bennet's fracture	Antemortem
GPO75	5158	1000-1200	F	36-45	1	1	L Lower rib (sternal end of shaft)	Transverse?	Antemortem
GPO75	5161	1000-1200	M?	18-25	0	0			
GPO75	5163	1000-1200	M	36-45	1	1	L5	Compression	Antemortem
GPO75	5164	1000-1200	F?	18-25	0	0			
GPO75	5165	1000-1200	NA	26-35	1	2	R Prox Foot Phalanx (head) and L5	Intra-articular fracture, Microfracture in Schmorl's Node	Antemortem
GPO75	5166	1000-1200	NA	36-45	0	0			
GPO75	5167	1000-1200	SA	SA	0	0			

GPO75	5168	1000-1200	M	26-35	1	2	T6 and T7	Microfracture in Schmorl's Node	Antemortem
GPO75	5169	1000-1200	SA	12-17	0	0			
GPO75	5170	1000-1200	SA	1-5	0	0			
GPO75	5172	1000-1200	M?	NA	0	0			
GPO75	5177	1000-1200	NA	NA	0	0			
GPO75	5178	1000-1200	M	36-45	0	0			
GPO75	5182	1000-1200	M	18-25	1	1	L3	Microfracture	Antemortem
GPO75	5183	1000-1200	M	36-45	1	1	L 1st Distal Hand Phalanx (base)	Intra-articular fracture	Antemortem
GPO75	5187	1000-1200	Int	26-35	0	0			
GPO75	5188	1000-1200	F?	NA	0	0			
GPO75	5189	1000-1200	F?	36-45	0	0			
GPO75	5190	1000-1200	F?	>45	1	2	L5, R 3rd Proximal Foot Phalanx (head), and L 3rd Distal Hand Phalanx (head)	Avulsion, Epiphyseal Avulsion	Antemortem
GPO75	5191	1000-1200	SA	12-17	0	0			
GPO75	5192	1000-1200	F?	36-45	0	0			

GPO75	5193	1000-1200	SA	6-11	0	0			
GPO75	5194	1000-1200	F	26-35	0	0			
GPO75	5195	1000-1200	M?	36-45	1	1	R Occipital	Comminuted	Antemortem
GPO75	5196	1000-1200	SA	1-5	0	0			
GPO75	5198	1000-1200	M	>45	1	1	R Humerus (distal epiphysis), R Ulna (proximal epiphysis), R Radius (proximal epiphysis)	Intra-articular (with dislocation)	Antemortem
GPO75	5199	1000-1200	M	36-45	0	0			
GPO75	5200	1000-1200	F	36-45	0	0			
GPO75	5201	1000-1200	M?	26-35	1	3	L Frontal, R Frontal, and L Parietal	2 Blunt force lesions, Puncture trauma	Perimortem
GPO75	5202	1000-1200	F	>45	0	0			
GPO75	5203	1000-1200	F?	18-25	1	2	L 5th Intermediate Hand Phalanx (body) and R Maxillary Canine (buccal side)	Oblique?, Crown Fracture	Antemortem
GPO75	5204	1000-1200	SA	6-11	0	0			
GPO75	5205	1000-	F?	26-35	0	0			

		1200							
GPO75	5206	1000-1200	F	26-35	1	12	R Patella (articular surface), R Proximal Foot Phalanx (base), T7, T9, T10, T12, L1, L2, L5, L 2nd MC (distal third), L 1st (base) and 2nd Proximal Hand Phalanges (base)	Avulsion, Intra-articular fracture, Microfractures in Schmorl's nodes, Impaction, Intra-articular fracture	Antemortem
GPO75	5207	1000-1200	F	>45	1	3	T2, T3, T4	Compression	Antemortem
GPO75	5208	1000-1200	SA	1-5	0	0			
GPO75	5209	1000-1200	M?	>45	0	0			
GPO75	5210	1000-1200	SA	1-5	0	0			
GPO75	5211	1000-1200	F	26-35	1	1	L3	Microfracture in Schmorl's Node	Antemortem
GPO75	5212	1000-1200	SA	1-5	0	0			
GPO75	5213	1000-1200	M	36-45	1	1	T8	Avulsion	Antemortem
GPO75	5214	1000-1200	SA	6-11	0	0			
GPO75	5215	1000-1200	M?	36-45	0	0			
GPO75	5216	1000-1200	M	NA	0	0			

GPO75	5217.1	1000-1200	SA	12-17	1	1	L4	Burst?	Antemortem
GPO75	5217.2	1000-1200	SA	12-17	0	0			
GPO75	5217.3	1000-1200	SA	1-5	0	0			
GPO75	5217.4	1000-1200	NA	NA	0	0			
GPO75	5218	1000-1200	F	26-35	1	2	L Humerus (distal epiphysis), R Radius (metaphysis)	Intra-articular fracture (distal end), Colles' fracture	Antemortem
GPO75	5220	1000-1200	M	26-35	1	1	T11	Microfracture	Antemortem
GPO75	5221	1000-1200	SA	1-5	0	0			
GPO75	5222	1000-1200	SA	12-17	0	0			
GPO75	5224	1000-1200	F	26-35	1	1	R 2nd Proximal Phalanx (distal third)	Oblique	Antemortem
GPO75	5225	1000-1200	F	26-35	0	0			
GPO75	5227	1000-1200	SA	1-6m	0	0			
GPO75	5228	1000-1200	SA	1-5	0	0			
GPO75	5229	1000-1200	NA	NA	0	0			
GPO75	5230	1000-1200	M	36-45	0	0			

GPO75	5233	1000-1200	NA	NA	0	0			
GPO75	5234	1000-1200	SA	1-5	0	0			
GPO75	5235	1000-1200	M	36-45	0	0			
GPO75	5236	1000-1200	NA	36-45	1	6	T8, T9, T10, L5, R 11th rib (mid-shaft), R Radius (metaphysis)	Compression, Posterior facet fracture, Oblique, Colles' fracture	Antemortem
GPO75	5237	1000-1200	M	18-25	1	1	L Frontal, L Parietal, R Parietal, R Temporal	SFT	Perimortem
GPO75	5238	1000-1200	F?	>45	0	0			
GPO75	5239	1000-1200	F	36-45	0	0			
GPO75	5240	1000-1200	F	>45	1	1	L Clavicle (lateral third)	Oblique?	Antemortem
GPO75	5241	1000-1200	F	36-45	0	0			
GPO75	5243	1000-1200	F?	26-35	0	0			
GPO75	5244	1000-1200	F	>45	1	1	L2	Posterior facet	Antemortem
GPO75	5244.1	1000-1200	F	NA	0	0			
GPO75	5247	1000-1200	SA	1-5	0	0			
GPO75	5248	1000-1200	NA	>45	0	0			

GPO75	5249	1000-1200	F?	36-45	0	0			
GPO75	5250	1000-1200	SA	SA	0	0			
GPO75	5251	1000-1200	NA	NA	0	0			
GPO75	5252	1000-1200	NA	NA	0	0			
GPO75	5253	1000-1200	SA	SA	0	0			
GPO75	5254	1000-1200	SA	SA	0	0			
GPO75	5255	1000-1200	M	26-35	0	0			
GPO75	5256	1000-1200	NA	NA	0	0			
GPO75	5257	1000-1200	F	36-45	1	1	L2	Compression	Antemortem
GPO75	5258	1000-1200	NA	NA	1	2	L 12th Rib (mid-shaft), R 6th Rib (angle)	Transverse (R), Greenstick (L)	Antemortem
GPO75	5259	1000-1200	SA	1-5	0	0			
GPO75	5260	1000-1200	SA	12-17	0	0			
GPO75	5280	1000-1200	F	36-45	0	0			
GPO75	5293	1000-1200	SA	12-17	0	0			

GPO75	5294	1000-1200	M	26-35	1	2	T12 and L 2nd MC (distal third)	Compression, Impaction	Antemortem
GPO75	5295	1000-1200	SA	1-5	0	0			
GPO75	5296	1000-1200	F	36-45	0	0			
GPO75	5303	1000-1200	M	36-45	0	0			
GPO75	5304	1000-1200	NA	18-25	0	0			
GPO75	5306	1000-1200	M	>45	1	1	R Ulna (Olecranon process and metaphysis)	Comminuted	Antemortem
GPO75	5308	1000-1200	F?	26-35	0	0			
GPO75	5309	1000-1200	NA	18-25	1	1	R Mandibular M2 (buccal side)	Crown Fracture	Antemortem
GPO75	5310	1000-1200	SA	1-5	0	0			
GPO75	5311	1000-1200	F	>45	0	0			
GPO75	5316	1000-1200	M	26-35	0	0			
GPO75	5318	1000-1200	SA	SA	0	0			
GPO75	5319	1000-1200	NA	>45	0	0			
GPO75	5322	1000-1200	SA	1-5	0	0			
GPO75	5776	1000-	NA	NA	0	0			

		1200								
GYE92	10181	1550-1666	NA	NA	0	0				
GYE92	10425	1550-1666	Int	NA	0	0				
GYE92	10644	1140-1230	NA	NA	0	0				
GYE92	10647	1140-1230	NA	NA	0	0				
GYE92	10650	1140-1230	F	26-35	0	0				
GYE92	10652	1140-1230	SA	12-17	0	0				
GYE92	10656	1140-1230	F	>45	0	0				
GYE92	10661	1140-1230	NA	NA	0	0				
GYE92	10682	1270-1350	M?	18-25	0	0				
GYE92	10688	1140-1230	Int	26-35	1	1		C3	Compression	Antemortem
GYE92	10689	1140-1230	SA	6-11	0	0				
GYE92	10690	1140-1230	M	18-25	0	0				
GYE92	10695	1140-1230	F?	36-45	0	0				
GYE92	10699	1140-1230	SA	12-17	0	0				
GYE92	10705	1140-1230	F	26-35	0	0				

GYE92	10723	1140-1230	M?	36-45	1	1	L 1st Proximal Foot Phalanx (head)	Intra-articular fracture	Antemortem
GYE92	10724	1140-1230	SA	12-17	0	0			
GYE92	10731	1140-1230	F	>45	0	0			
GYE92	10734	1140-1230	M	36-45	1	1	R Parietal (near sagittal suture)	Depression fracture	Antemortem
GYE92	10739	1140-1230	F?	36-45	0	0			
GYE92	10756	1140-1230	SA	6-11	0	0			
GYE92	10770	1140-1230	SA	1-5	0	0			
GYE92	10774	1140-1230	F?	36-45	0	0			
GYE92	10786	1140-1230	F	36-45	0	0			
GYE92	10792	1140-1230	M	26-35	0	0			
GYE92	10856	1140-1230	SA	6-11	0	0			
GYE92	10862	1140-1230	SA	6-11	0	0			
GYE92	10890	1140-1230	SA	6-11	0	0			
GYE92	10891	1140-1230	M?	18-25	0	0			
GYE92	10894	1140-1230	F	26-35	0	0			

GYE92	10912	1140-1230	F	18-25	0	0
GYE92	10915	1140-1230	M?	36-45	0	0
GYE92	10932	1140-1230	NA	NA	0	0
GYE92	10947	1140-1230	NA	NA	0	0
GYE92	10957	1140-1230	M?	26-35	0	0
GYE92	11692	1050-1140	M?	NA	0	0
GYE92	13017	1140-1230	F	18-25	0	0
GYE92	13056	1140-1230	M	18-25	0	0
GYE92	13110	1140-1230	SA	1-5	0	0
GYE92	13209	1140-1230	SA	6-11	0	0
GYE92	13281	1140-1230	NA	36-45	0	0
GYE92	13287	1140-1230	F?	>45	0	0
GYE92	13316	1140-1230	SA	6-11	0	0
GYE92	13366	1140-1230	SA	6-11	0	0
GYE92	13367	1140-1230	F	26-35	0	0

GYE92	17166	1050-1140	M	>45	1	2	2 Unsided ribs (sternal end of shaft and angle)	Transverse?	Antemortem
GYE92	20065	1050-1140	M	26-35	0	0			
GYE92	20105	1050-1140	M	36-45	1	1	R Frontal and R Parietal (near sagittal suture)	SFT	Antemortem
GYE92	20109	1050-1140	F	26-35	1	1	L Fibula (proximal third of diaphysis)	Oblique	Antemortem
GYE92	20113	1050-1140	F?	>45	0	0			
GYE92	20117	1050-1140	SA	7-11m	0	0			
GYE92	20277	1050-1140	SA	6-11	0	0			
GYE92	20533	1050-1140	SA	1-5	0	0			
GYE92	20538	1050-1140	M	26-35	1	2	L5 and R 2nd Rib (angle)	Spondylolysis and Oblique?	Antemortem
GYE92	20543	1050-1140	F?	18-25	0	0			
GYE92	20554	1050-1140	NA	36-45	0	0			
GYE92	20574	1050-1140	F	>45	1	1	Parietal (along sagittal suture)	SFT	Antemortem
GYE92	20590	1050-1140	NA	NA	0	0			
GYE92	20619	1050-1140	SA	1-5	0	0			
GYE92	20623	1050-	F?	36-45	0	0			

		1140							
NRT85	19	1200-1500	F	>45	1	4	R Ulna (distal third), L Radius (metaphysis), R 5th MC (distal third), R Nasal	Transverse?, Colles' fracture, Impaction?, Transverse	Antemortem
NRT85	22	1200-1500	M	18-25	1	2	L 2nd Rib (mid-shaft), L Scapula (acromion process)	Transverse?	Antemortem
NRT85	25	1200-1500	Int	26-35	0	0			
NRT85	31	1200-1500	M	36-45	0	0			
NRT85	33	1200-1500	SA	12-17	0	0			
NRT85	35	1200-1500	SA	12-17	0	0			
NRT85	58	1200-1500	F?	26-35	0	0			
NRT85	62	1200-1500	Int	18-25	0	0			
NRT85	76	1200-1500	M	36-45	0	0			
NRT85	95	1200-1500	M	36-45	0	0			
NRT85	133	1200-1500	SA	1-5	0	0			
NRT85	148	1200-1500	M?	26-35	1	1	L Nasal	Transverse	Antemortem
NRT85	269	1200-1500	M	18-25	0	0			

NRT85	287	1200-1500	F	>45	1	1	L Radius (metaphysis)	Colles' fracture	Antemortem
NRT85	298	1200-1500	M	18-25	1	3	R Femur (metaphysis), R Patella (articular surface), and L Occipital	Possible Type II Salter Harris Fracture (femur), Avulsion (patella), and BFT? (occip)	Antemortem
NRT85	299	1200-1500	NA	NA	0	0			
NRT85	309	1200-1500	M	18-25	0	0			
NRT85	318	1200-1500	SA	12-17	0	0			
NRT85	324	1200-1500	F?	26-35	0	0			
NRT85	330	1200-1500	SA	1-5	0	0			
NRT85	336	1200-1500	SA	12-17	0	0			
NRT85	339	1200-1500	F?	>45	1	2	L Femur (distal third of diaphysis) and R 2nd Rib (sternal end of shaft)	Oblique, Transverse	Antemortem
NRT85	346	1200-1500	M?	26-35	1	1	Unknown T Vertebra	Compression	Antemortem
NRT85	349	1200-1500	F	36-45	0	0			
NRT85	351	1200-1500	SA	12-17	0	0			

NRT85	355	1200-1500	SA	Perinatal	0	0			
NRT85	358	1200-1500	M	36-45	0	0			
NRT85	360	1200-1500	SA	12-17	0	0			
NRT85	367	1200-1500	SA	12-17	1	1	L Frontal	Depression fracture	Antemortem
NRT85	374	1200-1500	NA	NA	0	0			
NRT85	377	1200-1500	SA	12-17	0	0			
NRT85	381	1200-1500	M	NA	0	0			
NRT85	383	1200-1500	F	>45	0	0			
NRT85	387	1200-1500	M?	26-35	0	0			
NRT85	389	1200-1500	SA	1-5	0	0			
NRT85	391	1200-1500	M	26-35	0	0			
NRT85	394	1200-1500	M	18-25	0	0			
NRT85	397	1200-1500	M?	18-25	0	0			
NRT85	428	1200-1500	SA	6-11	0	0			
NRT85	430	1200-1500	M	18-25	0	0			

NRT85	433	1200-1500	SA	6-11	0	0			
NRT85	456	1200-1500	SA	1-5	0	0			
NRT85	472	1200-1500	M	>45	0	0			
NRT85	503	1200-1500	M?	36-45	0	0			
NRT85	578	1200-1500	M	36-45	0	0			
NRT85	625	1200-1500	M	36-45	0	0			
NRT85	627	1200-1500	NA	NA	0	0			
NRT85	629	1200-1500	SA	SA	0	0			
PIC87	32	1200-1538	F	36-45	0	0			
PIC87	33	1200-1538	NA	NA	0	0			
PIC87	77	1200-1538	F?	36-45	0	0			
PIC87	111	1200-1538	Int	26-35	0	0			
PIC87	125	1200-1538	NA	NA	0	0			
PIC87	140	1200-1538	NA	NA	1	1	R Ulna (distal third of diaphysis)	Oblique	Antemortem
PIC87	142	1200-1538	M	26-35	0	0			
PIC87	159	1200-	Int	>45	0	0			

		1538							
PIC87	160	1200-1538	SA	6-11	0	0			
PIC87	170	1200-1538	F?	18-25	0	0			
PIC87	175	1200-1538	F?	26-35	0	0			
PIC87	198	1200-1538	SA	12-17	0	0			
PIC87	221	1200-1538	SA	1-5	0	0			
PIC87	222	1200-1538	M	>45	0	0			
PIC87	227	1200-1538	F?	NA	1	2	L Clavicle (lateral third) and L Parietal	Oblique? and Depression fracture	Antemortem
PIC87	228	1200-1538	F?	>45	0	0			
PIC87	233	1200-1538	SA	1-5	0	0			
PIC87	234	1200-1538	M	>45	0	0			
PIC87	237	1200-1538	M	26-35	0	0			
PIC87	239	1200-1538	M?	18-25	0	0			
PIC87	240	1200-1538	SA	12-17	0	0			
PIC87	241	1200-1538	Int	36-45	0	0			

PIC87	242	1200-1538	SA	1-5	0	0			
PIC87	243	1200-1538	SA	12-17	0	0			
PIC87	256	1200-1538	NA	NA	0	0			
PIC87	257	1200-1538	M	26-35	0	0			
PIC87	265	1200-1538	M?	36-45	0	0			
PIC87	270	1200-1538	NA	NA	0	0			
PIC87	274	1200-1538	NA	NA	0	0			
PIC87	305	1200-1538	F	36-45	0	0			
PIC87	306	1200-1538	M	18-25	1	2	T10 and T11	Avulsion	Antemortem
PIC87	308	1200-1538	NA	NA	0	0			
PIC87	318	1200-1538	M?	>45	0	0			
PIC87	320	1200-1538	SA	12-17	0	0			
PIC87	325	1200-1538	M	26-35	0	0			
PIC87	331	1200-1538	M	36-45	1	1	L Proximal Foot Phalanx (head)	Intra-articular fracture	Antemortem
PIC87	334	1200-1538	F	>45	1	1	R Radius (metaphysis)	Colles' fracture	Antemortem
PIC87	343	1200-	F	26-35	0	0			

		1538							
PIC87	345	1200-1538	F	>45	0	0			
PIC87	355	1200-1538	NA	36-45	0	0			
PIC87	366	1200-1538	F	36-45	0	0			
PIC87	376	1200-1538	M	26-35	0	0			
PIC87	379	1200-1538	M	18-25	1	1	R Occipital	Depression fracture	Antemortem
PIC87	382	1200-1538	Int	18-25	0	0			
PIC87	405	1200-1538	Int	26-35	0	0			
PIC87	415	1200-1538	F	26-35	1	2	L Talus (articular surface with navicular) and L 5th MT (proximal metaphysis)	Crush (talus) and Transverse? (MT)	Antemortem (still healing)
PIC87	435	1200-1538	NA	NA	0	0			

PIC87	450	1200-1538	M	26-35	1	6	L Talus (posterior calcaneal articular surface), R Talus (posterior calcaneal articular surface), L Acetabulum (margin), R Acetabulum (margin), L 1st Proximal Foot Phalanx (base), and T3	Avulsion (talus), Avulsion (acetabula), intra-articular fracture (phalanx), Avulsion (T3)	Antemortem (still healing)
PIC87	462	1200-1538	NA	NA	0	0			
PIC87	465	1200-1538	NA	NA	0	0			
PIC87	474	1200-1538	NA	NA	0	0			
PIC87	504	1200-1538	M	36-45	1	1	L 5th MC (distal third)	Impaction?	Antemortem
PIC87	523	1200-1538	NA	NA	0	0			
PIC87	529	1200-1538	NA	NA	0	0			
PIC87	540	1200-1538	M?	NA	0	0			
PIC87	648	1200-1538	SA	6-11	0	0			
MIN86	5325	1353-1538	M?	NA	0	0			
MIN86	5787	1353-1538	NA	NA	0	0			
MIN86	6071	1350-	NA	NA	0	0			

		1400							
MIN86	6082	1350-1400	M?	26-35	0	0			
MIN86	6112	1350-1400	SA	12-17	0	0			
MIN86	6170	1350-1400	SA	6-11	0	0			
MIN86	6177	1350-1400	F?	26-35	0	0			
MIN86	6181	1350-1400	SA	6-11	0	0			
MIN86	6186	1350-1400	SA	12-17	0	0			
MIN86	6189	1350-1400	SA	12-17	0	0			
MIN86	6210	1350-1400	F	26-35	0	0			
MIN86	6213	1350-1400	SA	6-11	0	0			
MIN86	6225	1350-1400	M	36-45	1	1	R Talus (posterior calcaneal articular surface)	Avulsion	Antemortem
MIN86	6257	1350-1400	Int	18-25	0	0			
MIN86	6260	1350-1400	SA	1-5	0	0			
MIN86	6272	1350-1400	F	18-25	1	4	R Femur (distal epiphysis), 2 Unknown T Vertebrae, L Occipital	Intra-articular fracture, Avulsion, Puncture Trauma	Antemortem

MIN86	6280	1350-1400	NA	NA	0	0			
MIN86	6330	1350-1400	F	18-25	0	0			
MIN86	6351	1350-1400	M	36-45	1	3	L Mandibular M1 (lingual side), T8 and L1	Crown-dentin-pulp fracture, Microfracture in Schmorl's Nodes	Antemortem
MIN86	6360	1350-1400	F?	18-25	0	0			
MIN86	6371	1350-1400	M?	18-25	0	0			
MIN86	6421	1350-1400	NA	NA	0	0			
MIN86	6464	1350-1400	SA	SA	0	0			
MIN86	6489	1350-1400	M	26-35	0	0			
MIN86	6565	1350-1400	F?	18-25	0	0			
MIN86	6959	1350-1400	M	18-25	0	0			
MIN86	7002	1350-1400	NA	NA	0	0			
MIN86	7020	1350-1400	F?	26-35	0	0			
MIN86	7032	1350-1400	M	36-45	0	0			
MIN86	7039	1350-1400	M	18-25	1	1	L Tibia (tibial tuberosity)	Avulsion	Antemortem

MIN86	7068	1350-1400	F?	26-35	0	0			
MIN86	7096	1350-1400	SA	SA	0	0			
MIN86	7102	1350-1400	M	>45	1	6	L Patella (right side of articular surface), Nasal, L Ulna (distal third), L Radius (distal third), L Frontal, and L Parietal	Crush? (patella), Oblique (radius and ulna), BFT	Antemortem
MIN86	7172	1350-1400	F	36-45	0	0			
MIN86	7193	1350-1400	SA	12-17	0	0			
MIN86	7202	1350-1400	M	26-35	1	4	L Femur (distal epiphysis) and 3 Unknown T Vertebrae	Intra-articular fracture, Avulsion	Antemortem
MIN86	7223	1350-1400	M	36-45	1	2	2 L Ribs (one at angle and one at sternal end of shaft)	Transverse	Antemortem
MIN86	7228	1350-1400	F	36-45	1	2	L Clavicle (medial articular surface) and L Mandibular M2 (lingual side)	Avulsion, Crown fracture	Antemortem
MIN86	7245	1350-1400	F?	36-45	1	1	T8	Compression	Antemortem
MIN86	7253	1350-1400	SA	1-5	0	0			
MIN86	7268	1350-1400	M	18-25	0	0			

MIN86	7294	1350-1400	M	18-25	0	0			
MIN86	7301	1350-1400	SA	12-17	0	0			
MIN86	7314	1350-1400	M	>45	1	1	T5	Projectile	Antemortem
MIN86	7317	1350-1400	SA	12-17	0	0			
MIN86	7322	1350-1400	Int	>45	0	0			
MIN86	7326	1350-1400	NA	NA	0	0			
MIN86	7329	1350-1400	F	36-45	0	0			
MIN86	7358	1350-1400	M	26-35	1	1	R Radius (distal metaphysis)	Colles' fracture	Antemortem
MIN86	7367	1350-1400	F?	NA	1	1	R Fibula (mid-shaft)	Puncture Trauma	Perimortem
MIN86	7370	1350-1400	SA	1-5	0	0			
MIN86	7383	1350-1400	SA	SA	0	0			
MIN86	7418	1350-1400	M	26-35	1	2	L Frontal and L Ulna (distal epiphysis)	Depression fracture and Intra-articular fracture	Antemortem
MIN86	7425	1350-1400	M	26-35	0	0			
MIN86	7426	1350-1400	SA	6-11	0	0			

MIN86	7440	1350-1400	SA	1-5	0	0			
MIN86	7472	1350-1400	M	26-35	0	0			
MIN86	8001	1350-1400	M?	>45	0	0			
MIN86	8004	1350-1400	Int	36-45	1	1	R Talus (posterior calcaneal articular surface)	Avulsion	Antemortem
MIN86	8012	1350-1400	M	36-45	0	0			
MIN86	8015	1350-1400	F	26-35	0	0			
MIN86	8016	1350-1400	M	36-45	0	0			
MIN86	8035	1350-1400	NA	NA	0	0			
MIN86	8053	1350-1400	NA	NA	0	0			
MIN86	8102	1350-1400	M	36-45	1	4	L Clavicle (lateral third), R Zygomatic, L Zygomatic, R Nasal, Occipitomastoid suture	Greenstick, Linear (BFT), Diastatic with Microfractures	Antemortem (clavicle), Perimortem (all others)
MIN86	8108	1350-1400	M?	26-35	0	0			
MIN86	8111	1350-1400	F	>45	0	0			
MIN86	8112	1350-1400	M?	26-35	0	0			
MIN86	8117	1350-	F	18-25	1	1	T7	Avulsion	Antemortem

		1400								
MIN86	8120	1350-1400	F?	36-45	0	0				
MIN86	8133	1350-1400	F	36-45	0	0				
MIN86	8136	1350-1400	SA	6-11	0	0				
MIN86	8157	1350-1400	F?	18-25	0	0				
MIN86	8166	1350-1400	M	36-45	0	0				
MIN86	8173	1350-1400	F	18-25	0	0				
MIN86	8207	1350-1400	M	36-45	1	1	R Ulna (distal epiphysis)	Intra-articular fracture	Antemortem	
MIN86	8210	1350-1400	Int	36-45	0	0				
MIN86	8268	1350-1400	F	18-25	0	0				
MIN86	8285	1350-1400	M	18-25	0	0				
MIN86	8320	1350-1400	SA	6-11	0	0				
MIN86	8336	1350-1400	M?	>45	0	0				
MIN86	8385	1350-1400	SA	1-5	0	0				
MIN86	8398	1350-1400	SA	6-11	0	0				
MIN86	8446	1350-1400	M	36-45	0	0				

MIN86	8454	1350-1400	M	>45	0	0			
MIN86	9017	1350-1400	NA	NA	0	0			
MIN86	9310	1353-1538	SA	12-17	0	0			
MIN86	9313	1353-1538	SA	6-11	0	0			
MIN86	9316	1353-1538	M?	NA	0	0			
MIN86	9317	1353-1538	NA	NA	1	1	L Femur (proximal third)	Greenstick?	Antemortem
MIN86	9320	1353-1538	SA	6-11	0	0			
MIN86	9324	1353-1538	F	18-25	0	0			
MIN86	9327	1353-1538	M	NA	1	1	L Radius (distal metaphysis)	Colles' fracture	Antemortem
MIN86	9334	1353-1538	F	>45	1	2	R Ulna (distal third) and T6	Transverse?, Compression	Antemortem
MIN86	9339	1353-1538	F	26-35	0	0			
MIN86	9342	1353-1538	NA	NA	0	0			
MIN86	9351	1353-1538	SA	6-11	0	0			
MIN86	9354	1353-1538	M?	18-25	0	0			
MIN86	9362	1353-1538	F	26-35	0	0			

MIN86	9365	1353-1538	M	>45	0	0			
MIN86	9369	1353-1538	SA	6-11	0	0			
MIN86	9373	1353-1538	M	18-25	1	1	T9	Compression	Antemortem
MIN86	9376	1353-1538	SA	6-11	0	0			
MIN86	9380	1353-1538	Int	36-45	0	0			
MIN86	9383	1353-1538	F?	NA	0	0			
MIN86	9386	1353-1538	M	>45	0	0			
MIN86	9392	1353-1538	SA	1-5	0	0			
MIN86	9395	1353-1538	M?	26-35	0	0			
MIN86	9403	1353-1538	M	36-45	1	1	R Humerus (head)	Crush	Antemortem
MIN86	9411	1353-1538	M?	36-45	0	0			
MIN86	9414	1353-1538	SA	6-11	0	0			
MIN86	9417	1353-1538	M?	NA	0	0			
MIN86	9420	1353-1538	M	>45	0	0			
MIN86	9425	1353-1538	M?	26-35	1	1	R Mandibular Canine (buccal side)	Crown fracture	Antemortem
MIN86	9519	1350-	F	18-25	1	1	R Clavicle (lateral	Oblique?	Antemortem

		1400					third)		
MIN86	9543	1350-1400	M	>45	1	2	L Occipital and R Rib (mid-shaft)	Depression fracture, Transverse	Antemortem
MIN86	9608	1350-1400	M?	36-45	1	1	R Parietal	Depression fracture	Antemortem
MIN86	9635	1350-1400	NA	NA	0	0			
MIN86	9650	1350-1400	NA	NA	0	0			
MIN86	9659	1350-1400	SA	12-17	0	0			
MIN86	9662	1350-1400	M?	36-45	1	5	L Ulna (distal epiphysis), L Radius (distal epiphysis), L Lunate, L Scaphoid, L Mandibular Canine (buccal side)	Intra-articular fractures (with dislocation), Crown Fracture	Antemortem
MIN86	9665	1350-1400	SA	12-17	0	0			
MIN86	9759	1350-1400	SA	6-11	0	0			
MIN86	9778	1350-1400	SA	1-5	0	0			
MIN86	9810	1350-1400	M?	26-35	1	1	R Parietal	SFT	Antemortem (still healing)

MIN86	9813	1350-1400	M	36-45	1	6	R Humerus (proximal third), T1, T6, T7, T9, and L2	Greenstick, Avulsion (T verts), Microfracture in Schmorl's Node (L2)	Antemortem
MIN86	9828	1350-1400	M	36-45	1	1	Nasal	Transverse?	Antemortem
MIN86	9830	1350-1400	SA	6-11	0	0			
MIN86	9843	1350-1400	F	36-45	0	0			
MIN86	9859	1350-1400	SA	1-5	0	0			
MIN86	9883	1350-1400	F	26-35	0	0			
MIN86	9901	1350-1400	M	18-25	1	1	R Fibula	Greenstick?	Antemortem
MIN86	9925	1350-1400	F?	26-35	1	2	R Humerus (distal epiphysis) and L5	Intra-articular fracture, Avulsion	Antemortem
MIN86	9956	1350-1400	F	26-35	1	1	L Tibia (mid-shaft)	Transverse	Antemortem
MIN86	9960	1350-1400	F	36-45	0	0			
MIN86	9968	1350-1400	SA	12-17	0	0			
MIN86	9987	1350-1400	M	26-35	1	1	L Scapula (blade)	Comminuted	Antemortem
MIN86	9993	1350-	SA	1-5	0	0			

		1400							
MIN86	10058	1353-1538	M	18-25	1	4	R Humerus (mid-shaft), L Fibula (proximal third), L1, and R Mandibular Canine (buccal side)	Spiral, Oblique, Avulsion, Crown Fracture	Antemortem
MIN86	10060	1353-1538	SA	12-17	0	0			
MIN86	10063	1353-1538	NA	NA	1	1	R 1st Proximal Hand Phalanx (base)	Intra-articular fracture	Antemortem
MIN86	10070	1353-1538	M	36-45	0	0			
MIN86	10079	1353-1538	NA	NA	0	0			
MIN86	10082	1353-1538	SA	6-11	0	0			
MIN86	10087	1353-1538	SA	SA	0	0			
MIN86	10091	1353-1538	NA	NA	0	0			
MIN86	10094	1353-1538	NA	NA	0	0			
MIN86	10102	1353-1538	M?	36-45	1	3	R Femur (proximal third), R Calcaneus (posterior talur articular surface), and R Talus (posterior calcaneal articular surface)	Greenstick?, Avulsion	Antemortem

MIN86	10111	1353-1538	M?	26-35	1	1	R 1st MT (head)	Intra-articular fracture	Antemortem
MIN86	10124	1353-1538	M?	NA	1	1	T10	Compression	Antemortem
MIN86	10142	1353-1538	SA	12-17	0	0			
MIN86	10145	1353-1538	M	36-45	1	2	L5 and S1	Compression	Antemortem
MIN86	10159	1353-1538	F	>45	0	0			
MIN86	10164	1353-1538	M?	NA	1	1	R Lower Rib	Greenstick?	Antemortem
MIN86	10170	1353-1538	M	18-25	0	0			
MIN86	10177	1353-1538	M	>45	1	6	C6, C7, T12, L1-3	Compression	Antemortem
MIN86	10190	1353-1538	F	18-25	0	0			
MIN86	10218	1353-1538	M	26-35	1	1	T11	Avulsion	Antemortem
MIN86	10219	1353-1538	F	>45	0	0			
MIN86	10231	1353-1538	NA	26-35	1	3	2 L Ribs and T10	Greenstick	Antemortem
MIN86	10240	1353-1538	F	26-35	0	0			
MIN86	10241	1353-1538	M	36-45	0	0			
MIN86	10247	1353-1538	NA	NA	0	0			
MIN86	10250	1353-	SA	12-17	0	0			

		1538							
MIN86	10270	1353-1538	M	26-35	0	0			
MIN86	10287	1353-1538	M	36-45	1	4	R Patella (articular surface), T6, L Mandibular PM1 and M1	Crush, Compression, Crown Fractures	Antemortem (still healing)
MIN86	10348	1353-1538	M	>45	0	0			
MIN86	10386	1353-1538	M	36-45	0	0			
MIN86	10420	1353-1538	M	>45	1	2	L 5th Proximal Hand Phalanx (base) and T11	Intra-articular fracture, Avulsion	Antemortem
MIN86	10443	1353-1538	NA	18-25	0	0			
MIN86	10488	1353-1538	F?	26-35	0	0			
MIN86	10491	1353-1538	SA	6-11	0	0			
MIN86	10493	1353-1538	F	NA	1	2	R Mandible and C2 (R anterior facet)	Transverse, Linear	Antemortem
MIN86	10635	1353-1538	F	>45	0	0			
MIN86	10801	1353-1538	M	36-45	0	0			
MIN86	11005	1350-1400	M	36-45	1	3	R Parietal and L1	BFT, Puncture Trauma, Compression	Antemortem, Perimortem (puncture trauma)

MIN86	11008	1350-1400	SA	SA	0	0			
MIN86	11013	1350-1400	SA	1-5	0	0			
MIN86	11021	1350-1400	SA	1-5	0	0			
MIN86	11025	1350-1400	M?	36-45	1	1	R Femur (proximal third)	Greenstick	Antemortem
MIN86	11030	1350-1400	M?	18-25	0	0			
MIN86	11033	1350-1400	M?	18-25	0	0			
MIN86	11034	1350-1400	SA	12-17	0	0			
MIN86	11042	1350-1400	SA	6-11	0	0			
MIN86	11045	1350-1400	NA	NA	0	0			
MIN86	11048	1350-1400	SA	SA	0	0			
MIN86	11075	1350-1400	M?	36-45	0	0			
MIN86	11086	1350-1400	SA	SA	0	0			
MIN86	11090	1350-1400	F	26-35	0	0			
MIN86	11094	1350-1400	M	36-45	0	0			
MIN86	11098	1350-1400	SA	1-5	0	0			
MIN86	11199	1350-	F?	26-35	0	0			

		1400							
MIN86	11213	1350-1400	SA	1-5	0	0			
MIN86	11218	1350-1400	M?	26-35	0	0			
MIN86	11240	1350-1400	M	>45	0	0			
MIN86	11257	1350-1400	NA	NA	1	1	R 3rd Intermediate Hand Phalanx (base)	Intra-articular fracture	Antemortem
MIN86	11317	1350-1400	SA	1-5	0	0			
MIN86	11436	1350-1400	SA	12-17	1	1	R Occipital	Depression fracture	Antemortem
MIN86	11469	1350-1400	NA	NA	0	0			
MIN86	11475	1350-1400	M	26-35	1	5	L Nasal, R Middle Rib (sternal end of shaft), T7, T8, and L Mandibular M3 (lingual side)	Transverse (rib), Crush (T7, T8), Crown fracture	Antemortem
MIN86	11494	1350-1400	M	26-35	1	1	T9	Compression	Antemortem
MIN86	11615	1350-1400	SA	1-5	0	0			
MIN86	11656	1350-1400	M	26-35	0	0			
MIN86	11859	1350-1400	M	NA	0	0			
MIN86	11867	1350-	M?	36-45	0	0			

		1400							
MIN86	11901	1350-1400	SA	SA	0	0			
MIN86	11925	1350-1400	SA	SA	0	0			
MIN86	11937	1350-1400	Int	26-35	0	0			
MIN86	11954	1350-1400	SA	Perinatal	0	0			
MIN86	11956	1350-1400	F	>45	1	2	R Tibia (medial malleolus) and R Fibula (lateral malleolus)	Avulsion	
MIN86	11960	1350-1400	F?	18-25	0	0			
MIN86	11966	1350-1400	SA	6-11	0	0			
MIN86	11969	1350-1400	SA	12-17	0	0			
MIN86	11980	1350-1400	SA	1-5	0	0			
MIN86	12005	1353-1538	M?	18-25	0	0			
MIN86	12110	1353-1538	M	36-45	0	0			
MIN86	12162	1353-1538	NA	NA	0	0			
MIN86	12180	1353-1538	M?	NA	0	0			
MIN86	12185	1353-1538	NA	26-35	1	1	L Maxillary M1 (mesial side)	Enamel-dentin-pulp fracture	Antemortem

MIN86	12195	1353-1538	M	26-35	1	1	L Humerus (proximal third)	Spiral	Antemortem
MIN86	12201	1353-1538	M	NA	0	0			
MIN86	12297	1400-1538	F?	26-35	0	0			
MIN86	12324	1350-1400	NA	NA	0	0			
MIN86	12331	1400-1538	F	36-45	0	0			
MIN86	12339	1400-1538	F?	26-35	0	0			
MIN86	12345	1400-1538	NA	18-25	0	0			
MIN86	12349	1400-1538	M	36-45	1	1	Mandible (mental protuberance)	Transverse	Antemortem
MIN86	12356	1400-1538	M	>45	0	0			
MIN86	12365	1400-1538	Int	NA	0	0			
MIN86	12377	1353-1400	SA	SA	0	0			
MIN86	12382	1400-1538	SA	1-5	0	0			
MIN86	12400	1400-1538	M	36-45	0	0			
MIN86	12403	1400-1538	M	36-45	1	1	R Acetabulum	Comminuted/Crush	Antemortem
MIN86	12410	1400-1538	SA	12-17	0	0			

MIN86	12414	1400-1538	M	36-45	1	1	L4	Avulsion	Antemortem
MIN86	12424	1400-1538	M	36-45	0	0			
MIN86	12427	1400-1538	M?	26-35	0	0			
MIN86	12437	1400-1538	NA	NA	0	0			
MIN86	12445	1353-1400	F?	36-45	0	0			
MIN86	12450	1400-1538	M	>45	1	1	L Rib (sternal end of shaft)	Transverse	Antemortem
MIN86	12455	1400-1538	F?	26-35	0	0			
MIN86	12473	1400-1538	M?	NA	0	0			
MIN86	12480	1353-1400	M	36-45	0	0			
MIN86	12485	1400-1538	F	>45	1	1	T11	Avulsion	Antemortem
MIN86	12493	1400-1538	M	>45	1	3	2 L Ribs (sternal end of shafts), R 5th MT (proximal third) and T5	Transverse, Compression, Compression	Antemortem
MIN86	12497	1400-1538	F	36-45	1	1	T3	Compression	Antemortem
MIN86	12509	1350-1400	SA	SA	0	0			
MIN86	12520	1350-1400	M	36-45	1	1	R 1st Proximal Foot Phalanx (base)	Intra-articular fracture	Antemortem

MIN86	12525	1350-1400	M	18-25	1	1	R Occipital and R Parietal	SFT	Antemortem
MIN86	12530	1350-1400	M	>45	0	0			
MIN86	12531	1350-1400	SA	1-6m	0	0			
MIN86	12532	1350-1400	F	NA	0	0			
MIN86	12536	1350-1400	NA	NA	0	0			
MIN86	12542	1350-1400	NA	NA	0	0			
MIN86	12545	1350-1400	NA	NA	0	0			
MIN86	12556	1350-1400	SA	6-11	0	0			
MIN86	12559	1350-1400	SA	12-17	1	1	L Tibia (tibial tuberosity)	Avulsion	Antemortem
MIN86	12573	1350-1400	F?	36-45	0	0			
MIN86	12589	1350-1400	SA	1-5	0	0			
MIN86	12614	1350-1400	SA	6-11	0	0			
MIN86	12621	1350-1400	F	26-35	0	0			
MIN86	12629	1350-1400	SA	6-11	0	0			
MIN86	12648	1350-1400	F	36-45	1	1	L Maxilla and L Nasal	Comminuted	Antemortem

MIN86	12659	1350-1400	SA	1-5	0	0			
MIN86	12662	1350-1400	SA	1-5	0	0			
MIN86	12664	1350-1400	F?	36-45	1	2	L Frontal and L Parietal	Depression fractures	Antemortem
MIN86	12670	1350-1400	SA	SA	0	0			
MIN86	12677	1350-1400	SA	1-5	0	0			
MIN86	12680	1350-1400	SA	SA	0	0			
MIN86	12683	1350-1400	SA	1-5	0	0			
MIN86	12687	1350-1400	F	>45	0	0			
MIN86	12696	1350-1400	SA	12-17	0	0			
MIN86	12714	1350-1400	M?	18-25	1	1	L 3rd Proximal Hand Phalanx (body)	Unknown	Antemortem
MIN86	12743	1350-1400	SA	6-11	0	0			
MIN86	12747	1350-1400	F?	26-35	0	0			
MIN86	12757	1350-1400	M?	NA	1	1	L Ulna (distal third)	Transverse?	Antemortem
MIN86	12761	1350-1400	M	36-45	1	1	L1	Compression	Antemortem
MIN86	12767	1350-1400	M	26-35	0	0			

MIN86	12770	1350-1400	F	36-45	0	0			
MIN86	12777	1350-1400	SA	12-17	0	0			
MIN86	12785	1350-1400	M	26-35	0	0			
MIN86	12805	1350-1400	NA	NA	0	0			
MIN86	12812	1350-1400	M?	26-35	0	0			
MIN86	12881	1350-1400	M	36-45	1	1	R Maxillary I1 (lingual side)	Enamel-dentin-pulp fracture	Antemortem
MIN86	13518	1400-1538	F	>45	0	0			
MIN86	13530	1400-1538	M	>45	0	0			
MIN86	13622	1400-1538	M	26-35	1	2	R Frontal and L Frontal	Depression fracture (L side), SFT (R side)	Antemortem
MIN86	13624	1424-1538	M?	26-35	0	0			
MIN86	13633	1400-1538	NA	NA	0	0			
MIN86	13663	1353-1400	M	>45	1	3	R 3 Middle Ribs (angle and sternal end of shaft)	Transverse, Oblique, and Greenstick	Antemortem
MIN86	13666	1400-1538	M?	18-25	0	0			
MIN86	13670	1424-1538	F	>45	0	0			

MIN86	13675	1400-1538	M	36-45	1	1	L Ulna (mid-shaft)	Spiral?	Antemortem
MIN86	13678	1400-1538	M	36-45	0	0			
MIN86	13697	1400-1538	M	>45	1	1	L 1st Proximal Foot Phalanx (base)	Intra-articular fracture	Antemortem
MIN86	13711	1400-1538	SA	1-5	0	0			
MIN86	13724	1400-1538	F	36-45	0	0			
MIN86	13747	1400-1538	M	>45	0	0			
MIN86	13762	1353-1538	SA	6-11	0	0			
MIN86	13765	1400-1538	SA	6-11	0	0			
MIN86	13767	1400-1538	NA	NA	0	0			
MIN86	13774	1400-1538	M?	NA	0	0			
MIN86	13777	1400-1538	NA	NA	0	0			
MIN86	13778	1400-1538	NA	NA	0	0			
MIN86	13805	1400-1538	SA	1-6m	0	0			
MIN86	13825	1400-1538	M	36-45	0	0			
MIN86	13830	1353-1400	M	>45	0	0			

MIN86	13831	1400-1538	M	>45	1	3	T7, L1, and L5	Burst? (T7), Avulsion	Antemortem
MIN86	13840	1400-1538	M	36-45	1	3	L Rib, T9, and L1	Oblique, Avulsion (T9, L1)	Antemortem (in process: rib), Antemortem
MIN86	13848	1400-1538	M	>45	0	0			
MIN86	13849	1400-1538	Int	NA	0	0			
MIN86	13872	1400-1538	F	18-25	0	0			
MIN86	13887	1400-1538	SA	6-11	1	1	R Maxillary I2	Crown fracture	Antemortem
MIN86	13898	1400-1538	F	26-35	0	0			
MIN86	13906	1353-1400	NA	NA	0	0			
MIN86	13909	1400-1538	NA	NA	0	0			
MIN86	13913	1400-1538	SA	6-11	0	0			
MIN86	13928	1353-1400	NA	NA	0	0			
MIN86	13931	1353-1400	NA	NA	0	0			
MIN86	13935	1400-1538	M	26-35	0	0			
MIN86	13943	1353-1400	NA	NA	0	0			

MIN86	13959	1400-1538	F	26-35	0	0			
MIN86	13967	1353-1538	NA	NA	0	0			
MIN86	13970	1400-1538	NA	NA	0	0			
MIN86	13975	1400-1538	M?	36-45	1	1	L Tibia (proximal epiphysis)	Intra-articular fracture	Antemortem
MIN86	13984	1400-1538	NA	NA	1	1	L 4th MT	Compression	Antemortem
MIN86	14340	1400-1538	NA	NA	0	0			
MIN86	14405	1400-1538	SA	6-11	0	0			
MIN86	14421	1400-1538	SA	12-17	0	0			
MIN86	14424	1400-1538	SA	12-17	0	0			
MIN86	14429	1400-1538	SA	7-11m	0	0			
MIN86	14432	1400-1538	NA	36-45	0	0			
MIN86	16009	1400-1538	M	>45	0	0			
MIN86	16017	1353-1400	M?	NA	0	0			
MIN86	16033	1400-1538	SA	1-5	0	0			
MIN86	16042	1400-1538	M	36-45	0	0			

MIN86	16052	1388	NA	NA	1	2	C5 and R Humerus	SFT, Spiral	Perimortem (C5), Antemortem
MIN86	16063	1400-1538	NA	26-35	0	0			
MIN86	16073	1400-1538	M	>45	0	0			
MIN86	16076	1353-1388	M?	>45	0	0			
MIN86	16081	1400-1538	SA	1-5	0	0			
MIN86	16098	1400-1538	M	36-45	1	1	R Femur (distal epiphysis)	Intra-articular fracture	Antemortem
MIN86	16102	1400-1538	F	26-35	1	1	L Radius (distal epiphysis)	Intra-articular fracture	Antemortem
MIN86	16104	1400-1538	Int	>45	0	0			
MIN86	16119	1400-1538	SA	1-5	0	0			
MIN86	16122	1400-1538	NA	NA	0	0			
MIN86	16125	1400-1538	NA	NA	0	0			
MIN86	16128	1400-1538	NA	NA	0	0			
MIN86	16253	1400-1538	NA	NA	0	0			
MIN86	16257	1400-1538	NA	NA	0	0			
MIN86	16302	1400-	SA	12-17	0	0			

		1538							
MIN86	16304	1400-1538	M	>45	0	0			
MIN86	16311	1400-1538	NA	NA	0	0			
MIN86	16316	1400-1538	M	26-35	0	0			
MIN86	16326	1400-1538	NA	NA	0	0			
MIN86	16328	1400-1538	M	36-45	0	0			
MIN86	16332	1400-1538	M	NA	1	2	2 Unsided Upper Ribs	Transverse, Oblique	Antemortem
MIN86	16338	1400-1538	SA	SA	0	0			
MIN86	16344	1400-1538	M	26-35	0	0			
MIN86	20000	1353-1538	F	36-45	0	0			
MIN86	20001	1350-1400	F	36-45	0	0			
ONE94	67	1280-1666	M	36-45	0	0			
ONE94	648	1280-1666	SA	12-17	0	0			
ONE94	654	1280-1666	SA	SA	0	0			
ONE94	726	1280-1666	M	36-45	0	0			
ONE94	834	1280-1666	F?	18-25	0	0			

ONE94	838	1280-1666	M	26-35	0	0			
ONE94	861	1280-1666	NA	NA	1	1	T1	Compression	Antemortem
ONE94	864	1280-1666	F?	>45	1	8	R Ulna (distal third), R Radius (distal third), R 2nd-4th MC (body), and R 2nd-4th Proximal Hand Phalanges (body)	Oblique (ulna and radius), transverse (MCs and phalanges)	Antemortem
ONE94	867	1280-1666	M	26-35	0	0			
ONE94	914	1280-1666	F?	NA	1	1	L Clavicle	Oblique	Antemortem
ONE94	940	1250-1500	SA	6-11	0	0			
ONE94	963	1280-1666	F?	36-45	0	0			
ONE94	968	1280-1666	NA	NA	0	0			
ONE94	993	1250-1500	SA	1-5	0	0			
ONE94	996	1250-1500	SA	1-5	0	0			
ONE94	1501	1250-1500	M	>45	0	0			
ONE94	1511	1280-1666	F	36-45	1	2	R Zygomatic and L Occipital	Comminuted	Antemortem (in process)
ONE94	1566	1250-1500	M	36-45	0	0			
ONE94	1598	1250-	NA	NA	1	1	Unknown T Vertebra	Compression	Antemortem

		1500							
ONE94	1601	1250-1500	M?	36-45	1	3	L2 and Unsided Ribs	Compression and Transverse	Antemortem
ONE94	1623	1250-1500	SA	6-11	0	0			