Who are you beyond death? What can human remains tell us about the life history and death of individuals in four different battles in North-western Europe between 1400-1600s?

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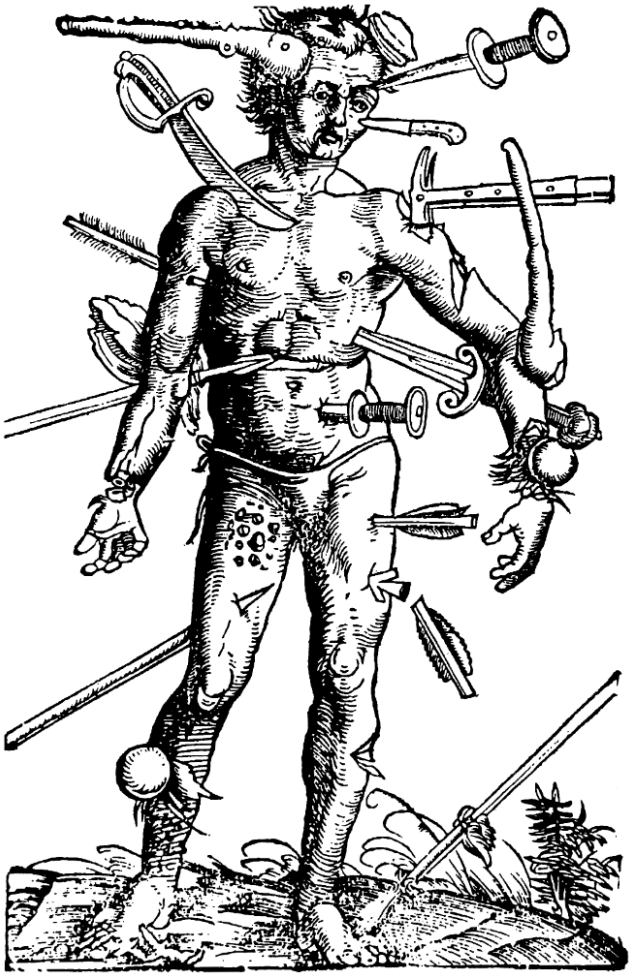

By Sofía Paz Espinoza Gutiérrez

Cover image: The woundman from Gerssdorffs ‘Feldbuch der Wundartzney’
(Knüsel & Boylston, 2007, p. 173)

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1. Introduction

1.1 Introduction

During the late medieval and early modern eras of Europe, wars and warfare were commonplace in numerous European societies. There were many famous battles and wars that were driven by different reasons. One example of this is the Thirty years war, which occurred between 1618 and 1648, it was fought between 'German Roman Catholics and protestants' (Bonney, 2014). Another is the battle of St Albans II in 1461, during the period of the Wars of the Roses (1455-1487). This battle was fought between the Yorkists and Lancastrians, and the main goal for the Yorkists was to advance into London (Burne, 2005). As well as the battle of Aljubarrota in 1385, during the times of the Hundred Years' war, between the forces of the Portuguese army against the French, the crown of Castile (Cunha & Silva, 1997), for Portuguese independence. While these battles were fought by thousands of soldiers, discussions are rarely about their lives and experiences, which are vital parts in the study of violence. For example, the army that fought in Aljubarrota consisted of approximately 6500 Portuguese soldiers (Cunha & Silva, 1997). By the end of the fight, approximately 6,000 soldiers from both armies died on the battlefield. Whereas the armies that fought in St Albans consisted of approximately 24,000 soldiers between each army, and the noted casualties are 6,000 losses between them (Castelow, n.d.). The extent of violence that can be observed is quite comparable within itself, since a substantial proportion of the soldier population lost their lives in these battles.

While of course numerous deaths occurred on the battlefield, disease in the camps proved to be a strong contributor to the death toll as well (Wilson, 2009). It is likely that poor living circumstances and nutrition during the war would have made soldiers more susceptible to infectious diseases.

1.2 Research problem

Most of what is known about the medieval and early modern battles in Europe, come from historical sources. Yet, more recently, there has been a growing connection between the historical and archaeological approach to these studies. Battlefield archaeology is a field that is expanding and has a foundation in traditional historic military studies (Carman, 2013). The goal is to "bridge the gap between the dead and the living" (Martin et al., 2012 pg. 3). However, studies within this field only seem to include a historical perspective, with a slight material interpretation coming from the study of the site, but no consideration for the life histories of the people who fought in those battles (Carman, 2013)

One example of this is Little Bighorn in the United States of America. This study was mainly focused on the ammunition present at the battlefield (Carman, 2013), and even though this proved to be an advance in the field of battlefield archaeology, because they introduced the

use of metal detection, it also does not provides a complete perspective, since only the warfare aspect of the battlefield is studied and the personal context of the battle is left behind (Carman, 2013).

There are some exceptions, where human remains have been studied in the past within battlefield archaeology, examples of this are studies done in Aljubarrota and Wisby (Carman, 2013). However, these investigations were able to only produce information about the general health context of the population, but failed to further study the personal life and death of the soldiers who fought in the battle (Carman, 2013). There is a great understanding of weapon technologies, and general aspects of health because of these studies, but there is no further interpretation from there. There is no attempt to follow through in order to understand better how it was to be a soldier in the late medieval and early modern eras. This could be aided by the comparative study of these populations and their different societal and personal contexts, to be able to build the identity of those who died and bring them back into the interpretation of battlefields.

As a result, the goal of this thesis is to advance the field's underdeveloped understanding of the life history of soldiers, meaning any markers of their previous lives left in their bones, which could reveal different aspects of a soldier's life. It aims to use this general health knowledge and documentation, and then further expand it by comparing not only their injuries and diseases, but also their demographics, like sex and age at death with other collections from around Europe. This can help provide a better understanding of people who fought in various battles and how their lives and deaths compare even if they lived in different societal contexts.

1.3 Research questions

This thesis will aim to aid in the understanding of life histories of soldier populations by answering the research question:

> What can we learn about the life history and death of the people who fought in different late medieval battles by studying their skeletons?

To be able to answer this question, three sub questions have been formulated. They are focused on the study of demographics of the battle victims, on pre-existing pathological conditions that could reveal more about the life history of an individual, as well as on trauma sustained before (ante-mortem) and around the time of death (peri-mortem) to learn about their manner of death.

These sub questions are:

- What are the demographic patterns (sex and age-at-death) of the skeletal collections and what differences can be observed when the different collections are compared?
- Which pre-existing stress related conditions can be observed and what do these reveal about the life history of the victims and what differences can be observed when the different collections are compared?
- What kind of peri-mortem trauma can be observed and what does this reveal about the manner of death of the victims and what differences can be observed when the different collections are compared?

1.4 Research approach

This research will focus on the study of life history and death of the victims of four late medieval and early modern battles in North-western Europe (figure 1). The first collection is from a battle believed to be one of the deadliest on British soil, the Battle of Towton in 1461, from the time of the War of the Roses (Cole, 1973). The second skeletal collection that will be included in this study comes from the mass grave in Uppsala in Sweden composed of victims who died during the battle of Good Friday in 1520 (Kjellström, 2005). The third collection is from the Battle of Lützen, Germany in 1632 during the Thirty Years' War (Nicklisch et al., 2017). The fourth and final skeletal collection that will be looked at in this thesis are the victims of the Siege of Alkmaar, the Netherlands in 1573 within the Eighty Years War (Schats et al., 2013). These collections have been chosen because detailed information on the victims including their pathological conditions and their ante and peri-mortem injuries is available. As well as the geographical location of all the sites and their continuity in date, while still having a good enough range.

For this research previously published skeletal data will be used. Data on the age-at-death and sex of the individuals will be used to get a better understanding of those who partook in the various battles under study. Secondly, pre-existing pathological conditions and ante-mortem injuries (trauma sustained before death) will be studied. This also includes evidence for occupational pathology and diseases related to stress, which reveals more about their health status and how the individual would have lived day by day. This can help identify the type of life they led, and by comparing these between the four different populations it is possible to study how the people fighting in these wars differed. Lastly, peri-mortem injuries, trauma sustained during the moments closely before or around death, are studied. These can aid in understanding how this individual died and a comparison of this to the previously mentioned data, may shed light on the different soldier experiences of medieval warfare in each of these battles.

Figure 1.1: A map of the locations of origin for the four skeletal collections studied in this thesis. [Blue: Towton, England; Orange: Alkmaar, the Netherlands; Red: Lützen, Germany; Yellow: Uppsala, Sweden] (https://contentdm.lib.byu.edu/digital/collection/Civilization/id/537/)

1.5 Thesis Structure

This introduction will be followed by presenting the theoretical and methodological background of this thesis: the research field the bioarchaeology of conflict and violence. After that, there will be an introduction to the materials used: the skeletal collections of victims from four different battles in the late medieval and early modern periods in North-western Europe. After this, I will present the methods that this research used, followed by the results which will give detailed information per collection and a comparison of the data. These results will then be interpreted and discussed in a discussion chapter. In the last chapter, the conclusions of this study will be presented by answering the research questions. This chapter will also present some possibilities for future research.

2. Bioarchaeology of conflict and violence

With the study of warfare and battlefields, comes the study of violence. Violence is long debated to be a part of human behaviour, especially in times of conflict. The study of bioarchaeology of violence and conflict is one that looks at the relationship between life history experiences and violence itself (Martin et al., 2012). The aim of this is to be able to understand more about how the people living in the times of warfare were affected by the systemic nature of violence (Martin et al., 2012). This chapter will introduce the theme of violence across human history, it will present the bioarchaeology of violence and the methods it uses for research, and ultimately two examples of successful application of these methods will be presented.

2.1 Violence and conflict in human history

Violence is defined as actions that are intended to hurt people (Cambridge dictionary). A key term in that definition is “intent”, indicating that it has a predetermined thought behind it. Violence is always executed with a meaning and it is never a ”senseless act” (Redfern, 2017, p. 16). It is a combined result of various factors, which can be both community and individual factors (Redfern, 2017). When violence is studied it needs to be looked at with these in mind. At the same time, violence is very easily exaggerated and spectacularized by researchers in order for it to become more attractive for the public (Redfern, 2017),

Based on different studies there is reason to believe that violence has always been a part of our society (Carman, 2013). There appears to be an important link between the developments in society and the extent in which it expresses violence. For example, the creation of technologies for tool making, have made it easier for us to kill each other as a result (Pinker, 2002; Redfern, 2017). Many researchers suggest that violence and war behaviour started at the same time as developed sedentary societies began forming (Redfern, 2017). But this is contradicted by the evidence of violence in several more ambulant hunter gatherer societies, which indicates that humans have had the predisposition to violence long before developing into organised societies with a fixed living location (Walker, 2001). For example, the graves at Nataruk in Lake Turkana. Twelve individuals who show evidence for intergroup violence during the late Pleistocene/early Holocene. These individuals showed no signs of burial as well as having evidence for sharp, blunt, and projectile trauma. According to Lahr et al. (2016) the violent occurrence could have been a resource raid that ended in attack. This is one of the examples by which one can see that violence was present in hunter gatherer groups (Lahr et al., 2016). There is no distinct pattern or context in which violence is present, violence demonstrates itself in many different cases and for distinctive reasons, some of these being access to resources, migration, and personal or social inequalities (Redfern, 2017).

Violence can be defined differently between varying cultures. Some areas of the world may be defined as violent, while on the opposite side of the world the same act can be considered a daily occurrence (Walker, 2001). However, in the context of warfare, there is a societal

predetermination for violence. There is a necessity for survival which just increases the capacity for violence (Redfern, 2017).

One particularly strong debate that is present in the study of violence is the question of: has humankind become more violent over time? This is however a difficult question to answer, as there is no way of fully establishing whether humans have increased or decreased in our tendency for conflict. The variability of this intensity gives different answers depending on where in the timeline the starting point is. Comparing the Middle Ages to today, the level of violence and warfare has decreased, but at the same time if a contrast is done between now and the prehistoric time of early hominins, an exponential increase is visible (Knüsel & Smith, 2013).

2.2 Introduction to Bioarchaeology of Violence

By definition, bioarchaeology "emphasises integrative, interdisciplinary analysis of the links between biology and culture in past societies" (Spencer, 2014, p. 888-89). Bioarchaeology is thus the link between biology and history, specifically in regard to human remains. Spencer (2014) states that bioarchaeology has contributed to the understanding of how aspects of societies, like health and lifestyle, have affected the human experience (Spencer, 2014). The bioarchaeology of violence studies the physical evidence for violence as left behind in human skeletal remains, as well as the aspects of societal relationships and the influence of violence in the evolutionary timeline of humankind (Martin, 2015).

Carman (2013) explains the emergence of material analyses in military history studies, and how this has grown to be one of the predominant methods used in the study of battlefields. This research is broadly concerned in the sites themselves, and the research of human remains gets left behind (Carman, 2013). So, within the bioarchaeology of violence, osteoarchaeology and the study of human remains is rarely seen. Meaning that the individual histories of each of these soldiers are not properly studied, and the experience of a soldier in Medieval warfare in Europe is sometimes ignored.

2.3 Methods in Bioarchaeology of Violence

In the study of archaeology of violence "physical evidence" is the term that is used to signify any markers for weapon trauma as well as for any pathology present that could be related to violence in the human skeleton. This is an important part of the study of conflict in bioarchaeology, especially in the context of warfare. This evidence can aid in the understanding of life and manner of death of an individual. By also considering previously sustained trauma or other pathological conditions such as joint and infectious diseases. The study of the skeleton can highlight the experience of the forgotten soldiers, those who did not get a special grave with many grave goods, who were still important for the battle, and whose skeletons never forget the experience (Redfern, 2017).

2.3.1 Types of weapon trauma

The study of trauma is one of the key components in the study of violence. Especially in warfare, the use of different types of weapons can cause different types of injuries, and the time in which a person is injured can be established in their skeletal remains.
In the context of battle, different injuries can be identified such as sharp force, blunt force, and projectile trauma. Sharp force trauma is caused by cutting or stabbing (Nicklish et al., 2017). It is mostly related to weapons such as swords, knives, axes or any other sharp or serrated object that would cause evidence of a cut that is longer than it is wide (Blau & Ubelaker, 2016). Blunt force trauma is caused by collision with a hard flat or blunted surface (Nicklisch et al., 2017). In the case of blunt force trauma, the patterning of the injury is especially important. A pattern on a fall fracture would look different than a fracture caused by an assault, since the assault injury would most likely have multiple blows in different directions, as well as different forces (Love & Wiersema, 2016). Projectile trauma is caused by gunshots of ballistic objects or strikes from an arrowpoint. This type of injury can be recognized because it leaves a pattern of radiating fractures around the entry point. It looks different than both previously mentioned, since it has a more structured fracture, although this highly depends on both the velocity of the projectile and the brittleness of the bone (Love & Wiersema, 2016).

2.3.2 Time of injury

The time in which an injury is inflicted is essential in the study life history of an individual, as these are the aspects of their life that were substantial enough to leave a mark on the skeleton. Injuries which are ante-mortem, meaning that they happened before death (Blau & Ubelaker, 2016) can be recognized by advanced healing of the damage caused to the bone, since it can take from months up to years for a bone to fully remodel and heal (Sheen & Garla, 2022). In most cases, injuries that are defined as ante-mortem have influence on the understanding of the early life of the individual, although it crucial to understand that not all ante-mortem injuries may come from a violent background, an accident early in life or a domestic injury can also leave traces, and those should not be confused with signs of violence. It is also a possibility, within warfare context, that an underlying poorly healed injury or disease may have caused the individual to be more susceptible to death. The importance of ante-mortem injuries is that they can reveal what day to day life looked like, both in the context of violence and normal life.

If the damage to the bone shows very little to no evidence of healing, the injury would be defined as a peri-mortem injury. This is recognized as an injury that happens near time of death or is the immediate cause of death, leaving the body without the time to start the healing process in such a way it would be visible through macroscopic assessment (Blau & Ubelaker, 2016). These types of injury are not easily analysed, there is scarse evidence that can actually determine whether the injury is peri or post-mortem, there is an experience that is required to be able to recognize these injuries (Blau & Ubelaker, 2016). At the same time, the analysis done to confirm the results can give researchers a great amount of information

about the context in which the person was killed. Peri-mortem injuries are common in the study of battlefield archaeology, they usually give a lot of information on the types of weapons used to fight and kill opposing soldiers. Nowadays most of the research done in battlefield archaeology is focused on peri-mortem injuries, as they reveal a vital part of the context of war; the pattern and weapon used in battle. In contrast, ante-mortem injuries can reveal a lot about a person's life before they died in battle. Therefore, in this thesis, the study of both peri-mortem and ante-mortem injuries is done, to be able to get more information about the potential life history of the individuals that fought in a war as well as their potential manner of death.

2.3.3 Pre-existing conditions

In addition to the study of trauma and injuries potentially related to conflict and violence. It is also useful to investigate pre-existing conditions in the skeleton. This in order to get a full understanding of the life history of the victims of battle.

Degenerative processes and diseases are things that can affect how a bone breaks and they can have severe influences on the lifestyle of an individual (Cox & Mays, 2000). These factors can also influence the chances of survival of an individual. Joint diseases are most commonly seen in individuals who are of an older age. As life progresses, the surrounding muscle around the bone gets thinner, and it makes it harder for the joints to move smoothly (Folkens & White, 2005). This is what is considered a degenerative process since the point function degenerates over time. However, this type of joint degradation can also happen after strenuous activity or repeated hard labour (Cox & Mays, 2000).

Osteoarthritis is a well known process that happens when humans age, or specifically, it is most usually seen when the individual is 60 or older (Folkens & White, 2005). This process is also known as a degenerative joint disease. It occurs when the cartilage in between the bone is destroyed. Another well known process of Schmorl's nodes, these occur when there is a heavy load on the body for a long period of time, which causes the intervertebral disk to prolapse and affect the surrounding vertebral body (Faccia & Williams, 2008). Folkens and White (2005) state that this disease when studied at a population level can aid in the understanding of life activities in the past. At the same time, the study of pre-existing pathology at the population level is said to be of great help in order to establish any pattern or any particular job that was done. Cox & Mays (2000) also argue that there is a great importance in the use of degenerative pathologies, explaining that there are conclusions on the extent of activity and lifestyle that can be drawn from the study of these diseases (Folkens & White, 2005; Cox & Mays, 2000).

2.3.4 Examples of the application of the bioarchaeology of violence

The study of bioarchaeology of conflict uses a lot of different methods to gain the most complete interpretation possible. Willermet (2018) argues that bioarchaeology continues to

embrace an interaction between fields of sciences, anthropology and demography. To further understand how these methods of research can help in the further understanding of conflict. I will present two examples of application of methods from bioarchaeology of violence (Willermet, 2018).

The first example is the study done to the skeletal remains of the Chachapoya population by Kenneth Nystrom and Marla Toyne. In this study the goal is to reconstruct the identity of the Chachapoya population by studying the violence related trauma and demographics of the individuals. Nystrom and Toyne explain that they will be using three methods, morphological based sex estimation and age estimation as well as the analysis of injuries and any trauma seen in the cranio-facial area. Nystrom & Toyne (2013) argue that they do this because skeletal remains can highlight some unintentional consequences that are left from daily activities, and how these markers may have some evidence in a shared collective (Nystrom & Toyne, 2013). The result for the demographic studies shows a majority of males rather than females and a wide range of ages.

In terms of the injury overview, Nystrom & Toyne (2013) present evidence of ante-mortem, peri-mortem and postmortem injuries. All of which are widely spread out through all the individuals of all ages (Nystrom & Toyne, 2013). The ante-mortem injury especially is all located in the anterior aspect of the skull, which Brickley & Smith (2006) argue to be due to close up violent interactions (Brickley and smith, 2006). The use of these bioarchaeological methods show to be beneficial to the study of human identities and the reconstruction of a population that lived through a violent context. Because of this even distribution of injuries, Nystrom & Toyne (2013) argue that there might have been an implosion for violence in that specific population, further meaning that in the effect of the Inca's was far greater and they needed a lot to help defend their lands (Nystrom & Toyne, 2013). The use of these methods in this study again shows the conclusions that one can make with the help of the trauma left in the skeleton and shows even further how the use of bioarchaeology of violence can help in the description and study of violent societies (Nystrom & Toyne, 2013).

A second example of application of methods of bioarchaeology of violence is in the study conducted by Western & Hurst (2013). They studied populations from the Iron age, specifically at the site of Kemerton camp in Bredon hill. The main incentive for this study was to analyse the existing trauma in the collection and understand further the nature of this particular site (Western & Hurst, 2013). For this study the researchers used a morphological analysis of both sex and age estimation. In addition to an analysis of peri-mortem injuries that could be found across the remains in this collection, for this case the evidence seen was divided into the categories of sharp force and blunt force. They analysed and divided all of these in order to assess and compare the demographic results with the trauma evidence (Western & Hurst, 2013).

Based on the evidence present on the remains they discover that females were part of the collection and also presented the same level of injury as the male individuals (Western & Hurst, 2013). Wester and Hurts described how this could be the case in order to understand

the severity of the event of violence, since it would have included many people from the community. The trauma analysis showed a considerable amount of injuries on these individuals, and the developments and growth of weapons and of armour was taken into consideration when interpreting conclusions about the remains (Western & Hurst, 2013). One thing that was noted by Western and Hurts (2013) is the available information that could be used in this investigation. They clarified how it is important to know that behaviour itself could not be studied, but patterns of violent behaviour were possible, due to the fact that injuries can show prevalence of violence in some societies (Western & Hurst, 2013).

One important aspect that makes this application of methods efficacious is the evidence of peri-mortem trauma showing females, this meant that females indeed took part in conflict, and they could have done so just as much as the men (Western & Hurst, 2013). They emphasise how important the study of human remains is. They describe this process as a successful way to understand various aspects of life in the context of warfare and how it should be implemented in warfare studies. This shows how useful the implementations of these methods can be (Western & Hurst, 2013).

The bioarchaeological methods allow us to understand the raw data behind these injuries and individuals and thus helps us further in the interpretation for further research of life in the context of warfare (Western & Hurst, 2013).

2.5 Conclusion

The study of conflict within bioarchaeology is one that can give considerable information about the potential for violence in human behaviour. What evidence that violence leaves is what is examined and then further analysed in an interdisciplinary aspect. With the knowledge of recognition of both time and type of injury, researchers can see the full extent of a person's life and reveal the context of violence in which the individual was subjected to. At the same time, the study of other pathological conditions can provide an even more complete view on the individual's life history.
This thesis will analyse the presence and location of ante-mortem and peri-mortem trauma as well as the evidence for any other pathological conditions in four different collections from different sites in North-western Europe. This aims to give information on the potential life history of populations in late medieval early modern warfare periods.

3. Materials & Methods

This thesis will focus on the comparison between four collections from four different battles in North-western Europe during the Late medieval and early modern eras. The battles that will be studied are, the battle of Lützen (Germany), the battle of Towton (England), the siege of Alkmaar (The Netherlands) and the Battle of Good Friday in Uppsala (Sweden) (See figure 1.1). In this chapter the historical context, the excavation background and the burial analysis will be described. In addition to the methods used for the collection of data and the use of that data within this thesis. This will lead to the next chapter, where the results and comparison of demographic and palaeopathological data will be presented.

Site	Date of Battle		Individuals (n)
Lützen	1632		46
Towton	1461		38
Alkmaar	1573	Larger Mass Grave	22
		Smaller Mass Grave	9
Uppsala	1520		~60

Table 3.1 Overview of the individuals used for demographic and palaeopathological analysis per site and date. For Alkmaar the number is divided into those in the Larger and Smaller mass graves

3.1 Materials

3.1.1 Battle of Lützen, Lützen, Germany.

3.1.1.1 Historical background

The battle of Lützen (1632) was part of the Thirty Years War (1618-1648), it was a battle motivated by religion and the seek for political power between Swedish-German forces and Imperial forces (Wilson, 2018). The development of this battle was motivated by the leader Gustavus-adolphus, King of Sweden, and his need to protect his allies in Saxony. This battle is not recognized as being one of the bloodiest battles, but for being one of the longest ones (Schürger, 2015). The fight at Lützen resulted in the killing of Gustavus-adolphus, and the death tolls are estimated to be between 6000 to 9000 losses (Nicklisch et al., 2017), this number being on both sides of the battlefield. Even though the Swede-German army lost their leader, the debate on who won the battle is still ongoing (Brzezinski, 2001; Nicklisch et al., 2017).

Nicklish et al. (2017) explains how the life of a rural population was struck by all the looting and destruction of agricultural land (Nicklisch et al., 2017). As a result, the vast majority of recruits were not motivated by fame, fortune or religious conviction, they were motivated by hunger and the devastation of their land (Nicklisch et al., 2017). The weapons that were used in this battle mostly consisted of projectile weapons; this is known due to the use of a metal detector in the field. Nicklisch et al., (2017) describes how most of these were projectiles that can reveal the entire distribution and full extent of fighting that was carried out in Lützen.

3.1.1.2 Grave and burial practices

Two excavations were conducted on this 750-hectare battlefield, one in 2006, and another in 2011, the latter led to the discovery of the mass grave of the battle of Lützen, while the first one focused on the material analyses of metal mentioned in the paragraph above. (Nicklisch et al., 2017). During the digging process, it was decided that the remains would be taken out as they were found on site, meaning as one big block, for them to be analysed in an enclosed lab (Nicklisch et al., 2017,). This grave was seen as an "impressive monument of the Thirty years war" (Nicklisch et al., 2017,).

After the last excavation it became clear that the Lützen mass grave contained 46 individuals (Nicklisch et al., 2017). The skeletons were examined for stature, sex, age-at-death, pathological conditions and trauma evidence. (Nicklisch et al., 2017).
This study was done in order to calculate the prevalence for injuries during battle, this as a way of understanding "the lives and suffering of the individuals" (Nicklisch et al., 2017, p.7). As it can be seen in figure 3.2, there is no systematic way of burial for these individuals, the remains were found in 1-2 layers and this grave site shows significant difference in the burial method than other battle grave sites such as the one in Wittstock. (Nicklisch et al., 2017)

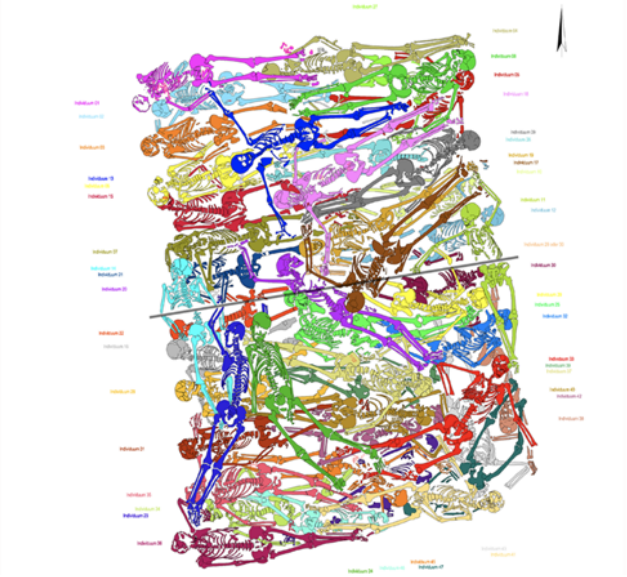

Figure 3.1: Graphic illustration of remains in the Lützen mass grave (Nicklisch etal., 2007, p. 11)

3.1.2 Battle of Towton, Towton, England.

3.1.2.1 Historical background

The War of the Roses (1455-1487), was a war between two parts of English nobility, the Yorkists, who fought for the right to the throne of England, and the Lancastrians, an army set up by Queen Margaret of Anjou in order to restore her sons Edward Prince of Wales honour in the British monarchy and salvage King Henry VI, who had been captured by Yorkists (Boardman, 2007).

In 1461, the fight between Yorkists and Lancastrians moved towards Towton. Burne (2005) explains how this battle developed in three phases. The first phase came with the attack of arrows and cannons. During the second phase, the Yorkists moved further in the front line and attacked the Lancastrians. During this phase, the head of the Lancastrian army Lord Dacres was killed, and left the army without a leader (Burne, 2005). The third phase progressed with support from armies in Norfolk who fought with the Yorkists, this further hindered an already fatigued Lancastrian army, which led them to retreat and heavy loss of life (Burne, 2005). The battle itself only lasted ten hours, but in the process, corpses began to build up in the river and spread out across the field, affecting the fight itself as well. By the end of the battle, approximately 28,000 individuals had died and been left in the field (Burne, 2005).

The seek of land titles and power had already taken countless deaths before and Towton was no different (Boardman, 2007). Boardman (2007) states that soldiers did not only fight for the honour of the king, but also for wages and looting for their own personal benefit. The context of the battle of Towton is English harsh winter. This shows how the men who fought in Towton were “extremely tough and resilient” (Boardman, 2007, p. 27).

3.1.2.2 Grave and burial practices

In 1996 construction workers uncovered human remains at Towton hall (Figure 3.3), this led to an excavation that was carried out in order to excavate and analyse the remains found at Towton (Fiorato, 2007). Along with the human remains, researchers also found pottery, metalwork, faunal remains and a worked bone object. The main goal of this excavation was to archaeologically identify the extent and the nature of the grave itself. (Burgess, 2007).

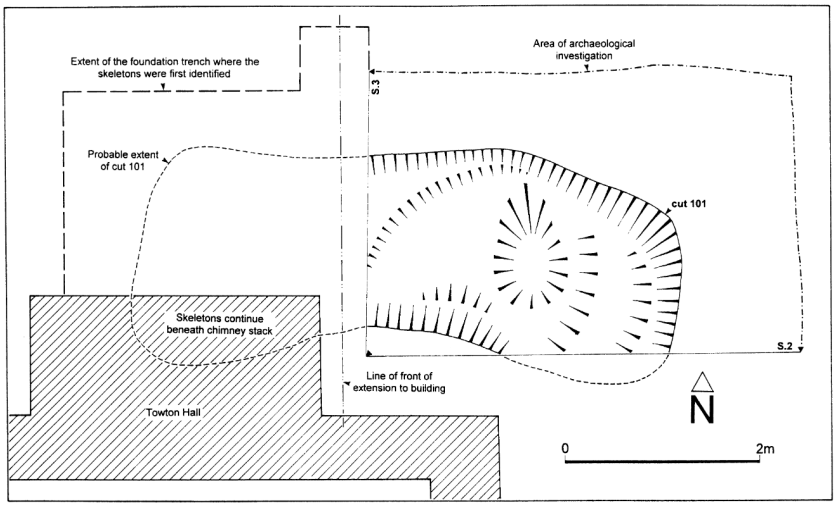

Figure 3.2: Map of the Towton excavation site. Highlighted Towton Hall, where the first remains were uncovered in 1996. (Burgess, 2007, p. 30)

Cumberpatch in Burgess (2007) describes that the pottery assemblage consisted mostly of eleventh, twelfth and thirteenth century material. There were some exceptions like, fifteenth century and roman sherds (Burgess, 2007). Minvielle-Debat in Burgess (2007) describes iron objects, nails and an unknown nail shaped object to be the main components of the metal assemblage. In addition, some copper-alloy lace tags and silver rings were also found on site (Burgess, 2007). Richardson in Burgess (2007) explains that faunal remains consisted mostly of cattle, sheep and pig. These remains were likely domesticated animals used as meat sources (Burgess, 2007). Finally, O'Connor in Burgess (2007) describes the worked bone object as being likely from a piece of clothing or a personal belonging, like a chest or box, this because it had traces of copper alloy. This assemblage aligns with the battle timeline and gives more information on life on the battlefield for these soldiers (Burgess, 2007).

A total of thirty-eighy individuals were excavated (Boylston et al., 2007). The first appearance of bone was at 0.5m of depth (Sutherland, 2007). Sutherland (2007) explains that the analysis proved that there were several articulated bones piled together in the space of the mass grave. The recording of these skeletons was not done in situ, this because the methods used to draw, and record would damage adjacent individuals since they were tightly packed together in the grave (Sutherland, 2007).

Sutherland (2007) explains that, according to the analysis done to the grave and the distribution of the remains, the individuals were not simply thrown into the grave, there seems to be a precise planning and packing, shown by the orientation (east-west, west-east axis) and distribution of the remains (Figure 3.4) (Sutherland, 2007). This being not as a respectful manner, but more as an "attempt to reduce labour" (Sutherland, 2007, p.41). Since the battle was carried out in winter, the ground would not have been the easiest to work with (Sutherland, 2007).

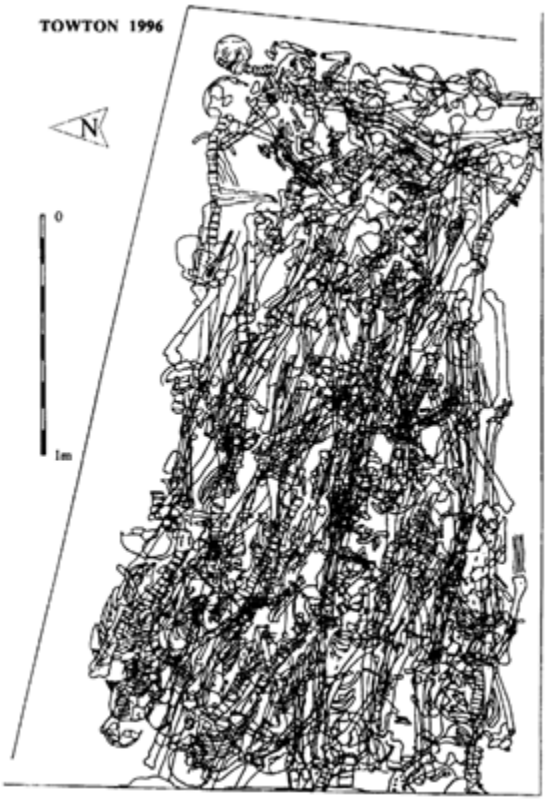

Figure 3.3: Illustration of the individuals in the Towton mass grave. (Sutherland, 2007, p. 40)

3.1.3 Siege of Alkmaar, Alkmaar, the Netherlands.

3.1.3.1 Historical background

The Eighty years war (1568-1648) was fought between the Dutch provinces against the Spanish royal armies for the purpose of getting independence from the Spanish monarchy (Trim, 2002).

During this period, the Dutch nobility had a system of autonomy, and they controlled their own forces and cities (Schats et al., 2013). During the 16th Century, when these autonomies became threatened because of Spanish influence, there was an increase of discontent among the elite of the Netherlands (Schats et al., 2013). The fight over power and control was not met on its own, there was an influence of religion and divided opinions that were key in the feeling of unity in the population from the Netherlands (Schats et al., 2013). The religious influence that is mentioned is the protestant movement across the country. All of this happened under King Charles Vs rule, who opposed the catholic faith and prosecuted and exiled everyone who thought differently (Schats et al., 2013).

Schats et al. (2013) explains how this religious disagreement fueled the next years of the Eighty years' war (Schats et al., 2013). The arrival of Fernando Alvarez de Toledo, otherwise known as Duke of Alva, was of significant importance for the Dutch resistance, since his laws on taxes and autonomy in the Netherlands created hatred towards him and “highly

motivated the Dutch inhabitants to withstand their oppressors" (van der Lem, 1995; Schats et al., 2013 p. 456). Those who had been exiled in the protestant persecutions later joined William of Orange in the fight against the Duke of Alva (Schats et al., 2013).

This hatred however proved to increase the violence in the Spanish army, they began seizing and destroying cities, like Naarden and Haarlem (Schats et al., 2013). But once again, this only moved the Dutch resistance to keep fighting against their oppressors. (Schats et al., 2013)

On August 21st 1573, after long periods of sieges and destruction of cities, the Spanish troops arrived at Alkmaar with what is estimated to be between 6,500 to 16,000 soldiers (Flagel, 2021). Dutch rebel troops proved to be dependable in crossfire and made the Spanish suffer severe loss of life (Schats et al., 2013). The Dutch army's use of natural resources was a successful strategy, the flooding of fields made the land harsh and ultimately led the Spanish troops to cease fire with losses of approximately 200 soldiers (Flagel, 2021). "Alkmaar became the first city to successfully defend itself against the Spanish army" (Nierop 2000; Wortel 1990; Schats et al., 2013, p. 456) this became a key moment in the history of the Netherlands, and it is still remembered to this day.

3.1.3.2 Grave and burial practices

An excavation was carried out in 2011 by Leiden University and Hollandia Archeologen. The excavation was focused on the Franciscan monastery cemetery from 1448-1573 (Schats et al., 2013). At first, this excavation revealed 189 inhumations, but as it progressed, two mass graves that had not been mentioned in previous historical sources were found (Schats et al., 2013).

In addition to the discovery of more human remains, multiple bullets were also present on site where the mass graves were revealed (Schats et al., 2013). Because of this, researchers believe that the graves were related to a 'violent event' (Komar, 2008; Schats et al., 2013, p. 457). This led them to the siege of Alkmaar of 1573. Which was the only violent event that had occurred in that territory and fit with the description of warfare used (Schats et al., 2013).

The new grave that was found in Alkmaar consisted of two parts; a larger mass grave, which had twenty-two individuals, and a smaller mass grave that had nine individuals. All of these remains were excavated and analysed individually (Schats et al., 2013). Schats et al. (2013) explains that the main goal was to examine the distribution of individuals, the chronology and the manner of burial. Since this information can reveal a lot about the social context of war (Schats et al., 2013).

According to the taphonomic evidence presented, there were remains of wood at the bottom layers but not at the top layers; this could mean that some of the individuals had coffins while the deeper individuals did not (Schats et al., 2013). Most of the individuals were buried with their crania oriented to the west, however in some cases it was the opposite, this could be due

to time constraints (Schats et al., 2013). Similar to what we see happening in the Towton and Lützen mass graves. Schats et al. (2013) notes the method of burial, the individuals were organised and with their hands folded over their chests (Figure 3.5). This could be an indicator for respectful burying (Schats et al., 2013). The Spanish army was very hostile towards the Dutch rebels, meaning that if the people buried here had been Spanish, they would not have been buried with such care. (Komar, 2008; Schats et al., 2013)

Figure 3.4: Top Layer of the larger mass grave in Alkmaar (Schats et al., 2013, p.458)

3.1.4 Battle of Good Friday, Uppsala, Sweden.

3.1.4.1 Historical background

During the 16th century, Denmark, Sweden and Norway had been in constant unrest. (Kjellström, 2005) The union and later disbandment of what used to be an alliance between the three countries, created an environment in which violence and hatred could be coerced into the minds of the people (Kjellström, 2005). This coercion was seen in the hands of Stern Sture the Younger, a Swedish nobleman with strong feelings against Denmark. In 1520, Sture had led a campaign against the Danish king, this attack was composed of full rural populations with insufficient training. The battle was commanded by the strong negative feelings against Gustav Trolle, a Swedish archbishop who excommunicated Sture (Kjellström, 2005). Even though Sture died before the beginning of the Good Friday battle his followers continued on with the attack. This feeling of violence and hatred led to the start of the Good Friday battle (Kjellström, 2005).

Sandstedt (2003) explains how those who were followers of Sture, had not been trained in combat and were not as skilled as their counterparts, who were highly trained royal troops from the King Kristian II of Denmark (Sandstedt, 2003; Kjellström, 2005). The Swedish army stood in the fight, but ultimately, the mercenary nature of the Danish troops got ahead and defeated the Swedish forces (Kjellström, 2005). At first, the remains of these soldiers

were not given a proper burial, until the Stockholm Bloodbath in 1520, and due to the number of massacred individuals from this latter event, the soldiers of the battle of Good Friday were finally laid to rest (Syse, 2003; Kjellström, 2005).

3.1.4.2 Grave and burial practices

An excavation took place in Uppsala in a site next to where human remains had been previously found in 1971 (Kjellström, 2005) (Figure 3.6). Kjellström (2005) describes that two large pits, assigned the names A2 and A4 are the main sites studied. A2 showed evidence of organisation in the burial of the remains (Syse, 2003; Kjellström, 2005). This pit contained two articulated individuals, who were buried in "traditional Christian orientation" (Kjellström, 2005, p.26), this meaning an east-west orientation. In A4 four articulated individuals were found, they were in the same orientation as those in A2. The A4 pit also contained a series of commingled remains that had not been organised in any particular way (Kjellström, 2005).

Syse (2003); Kjellström (2005) explains that the radiocarbon analysis done dated both A2 and A4 very similarly. This shows that both of these pits and the remains found in them can be compared and studied together, in order to research more about the mass grave in Uppsala (Syse, 2003; Kjellström, 2005).

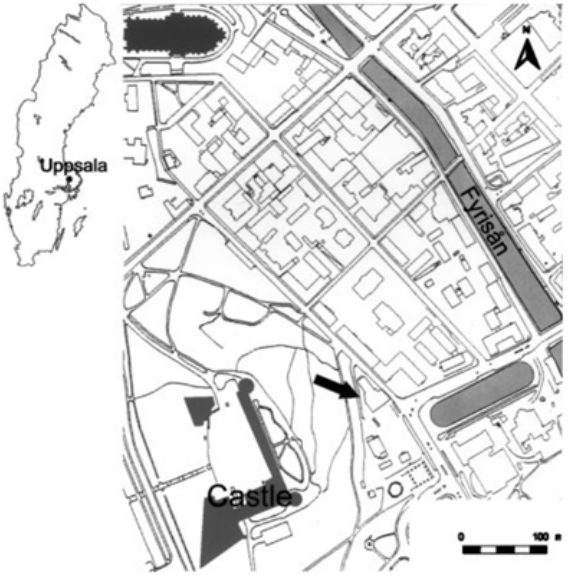

Figure 3.5: Map of the excavation site in Uppsala. The arrow points to the grave that was excavated (Kjellström, 2005, p. 26)

Kjellström (2005) explains how the individuals and the material found in both mass graves in Uppsala were divided into three categories. First, complete skeletons to some extent; second, the specific bones that were articulated; finally, commingled remains. The total number of remains that were excavated were 959 cranial, and 585 postcranial elements, and the minimum number of individuals that was concluded was 'at least 60' (Kjellström, 2005, p. 30).

Kjellström (2005) describes that the remains were examined for trauma, and demographic data, such as age, stature and sex estimation. The grave itself was also examined for any taphonomic developments since the aspect of carnivore activity would be important to note to compare this to actual peri-mortem trauma in the bones (Kjellström, 2005).

3.2 Methods

In this section a description of the methods used by all the sources will be carried out. This will be divided into categories following the demographic data, pre-existing conditions and existing trauma. I will explain how all of the data was collected and what methods were used. Finally, I will further explain how this thesis will use the data and how it will be modified in order to be used for this particular research.

3.2.1 Demographic data analysis

In all four collections macroscopical analysis of the remains was carried out in order to estimate sex and age at death. All the sources analysed the prevalence of defining characteristics for estimating on the pelvic bone and the skull. For all the sources the main method used was the one developed by Buikstra and Ubelaker in (1994), which stated the dimorphic differences in the cranio-facial aspect of the skull. For the pelvis the macro characteristics such as the flaring and the birthing canal aspect was analysed. For Lützen, Towton and Alkmaar the estimation was done in all of the complete and articulated material that was found on site, while for Uppsala the skulls and pelvises were used form the commingled collection on order to determine the prevalence and patterns for estimation of sex (Kjellström, 2005; Nickslisch et al., 2017; Schats et al., 2013; Boylston et al., 2007).

In terms of age at death estimation, all of the sources used macroscopical analysis of morphological traits in order to get answers from the remains. Characteristics such as cranial suture closure based on Meindl and Lovejoy (1985), dental eruption and epiphyseal fusion, used with the method of Buckberry and Chamberlain (2002) were examined as well as auricular surface and pubic symphysis aspects of the pelvic bone. The main phenice trait method that is present in all sources to estimate age at death is the pubic symphysis, this trait in conjunction with the auricular surface study based on Lovejoys method (1985) can reveal more information of the age of the individual at the time of death (Kjellström, 2005; Nickslisch et al., 2017; Schats et al., 2013; Boylston et al., 2007).

3.2.2 Pre-existing trauma analysis

The analysis of pre-existing conditions was quite limited in all of these sources. In Lützen the way in which the remains were excavated did not allow for an onsite investigation of the remains, thus meaning that the macroscopical analysis for pre-existing conditions was not

possible. However it was possible to examine for stress fractures and some notes of some (Nicklisch et al., 2017). For Towton the analysis was straightforward, looking for stress related markers such as osteoarthritis (polishing or eburnation of the joint) or Schmorl's node (depressions in vertebrae caused by strenuous work or old age) (Boylston et al., 2007). In the collection from Alkmaar the diseases that were noted were Schmorl's nodes and Intervertebral disc disease (Schats et al., 2013). And ultimately in Uppsala there is no mention of the study of pre-existing conditions anywhere in the utilised source (Kjellström, 2005).

3.2.3 Trauma analysis

The analysis for evidence of trauma in all of the collections was done based on the same knowledge about these injuries. All of them, with exception for Uppsala, separated the injuries into the three main categories, sharp force, blunt force and projectile. In the case of Uppsala, it is noted that there was no intent to study either blunt force or projectile trauma (Kjellström, 2005). They all looked for the same characteristics in order to determine whether it was one of these types of injuries, and at what time of their life the injury was inflicted. Some of these collections had a substantial majority of one type of trauma, so the main focus of the methods was there, this is the case for Uppsala and Alkmaar, where the injuries were predominantly sharp force and projectile injuries, respectively. One method that is also mentioned in all of the sources is the noting of defensive injuries, all sources indicate that the blows pertinent to the forearm and hand would substantiate a defensive injury, thus worthy of being noted (Kjellström, 2005; Nickslisch et al., 2017; Schats et al., 2013; Boylston et al., 2007).

In terms of the analysis of the time of injury all of the sources did use the same knowledge of characteristics of each injury which has been previously explained in this thesis (Chapter 2), looking for healing and bone formation in order to determine if the injury is old as well as noting whether the injury is enough to have caused death.

3.2.4 Data analysis

All of the methods for collection of data that have been used in the main sources, are public and comparable to each other. Sex estimation is noted to have some similarities specifically in the use of classification by the macroscopical analysis and categorising in Female/Male, Probable female/male or indeterminate. The use of basic analysis and macroscopic examination for the determination of injuries and pre-existing conditions is something that can be further compared in the study. However, it is important to note that this is different in one of the sources, Kjellström (2005) main composition consists of commingled remains, and articulated but not complete elements (Kjellström, 2005). This means that the data presented is not from completely articulated individuals but from different bones that still show evidence of violence, specifically in the cranial bones. These can still be compared with the

data from other sources, but it will exhibit different perspectives on the comparison of the data (Kjellström, 2005).

One of the main issues that is encountered is the age category division made in each of the sources. All of them are different in range and name. For the purpose of this investigation, I will be using the data presented by these sources but I will be creating unique age categories in order to present the results. The age categories are as follows, Old child (8-12), Adolescent (13-18), Young Adult (19-30), Middle Adult (31-45) and Old Adult (46+). This will make the information clearer for both the research and the reader and will make the comparison of data much simpler.

At the same time, the collections from Lützen, Towton and Alkmaar all present organised and collected data that will be used as presented by the authors (Nickslisch et al., 2017; Schats et al., 2013; Boylston et al., 2007). However, the collection from Uppsala will be taken and modified in order to fit in the comparison made for this research, only in the data collection aspect, all data used will be in correlation with the other data and no results will be changed from the ones presented by Kjellstom (2005).

I will recover the data from each source and annotate it using an excel spreadsheet, in order to analyse all of this data in comparison to each other. Looking at the results of sex estimation, age at death estimation, any evidence for pre-existing conditions, specifically those related to stress on the body, and any injuries present in the individuals from the time before (ante-mortem) and after death (peri-mortem). This, in order to answer the proposed research questions and learn more about the life of soldiers in battle in late medieval and early modern Europe.

4. Results

In this chapter a presentation of all the data results will be done. This will be done by theme. First, a presentation of the demographic data, meaning sex estimation and age at death will be presented for each battle collection. After the data for ante-mortem injuries and pre existing conditions will be presented, and lastly the data for peri-mortem injuries. At the same time in each of the subsections a comparison of the data will be done, this in order to progress to the next chapter of this thesis in which there will be a discussion about the results presented in this chapter.

4.1 Demographics: sex and age

In this section the results of the study of demographics, specifically sex and age of the individuals will be presented, this will be divided by battle, based on the information presented by the sources. At the end of the section, the results are compared between the collections.

4.1.1 Battle of Lützen, Germany

Out of the 47 victims found, Thirty-six were estimated to be male (77%) and for the remaining 11 (23.4%) sex could not be estimated (Nicklisch et al., 2017). The youngest individual was between 14 to 16 years old at time of death and the oldest individual was between 40 to 50 years old (Nicklisch et al., 2017). Most of the individuals (65.96%) were between the ages of 19 to 30 years old at time of death and fall under the young adult category (see figure 4.1) (Nicklisch et al., 2017).

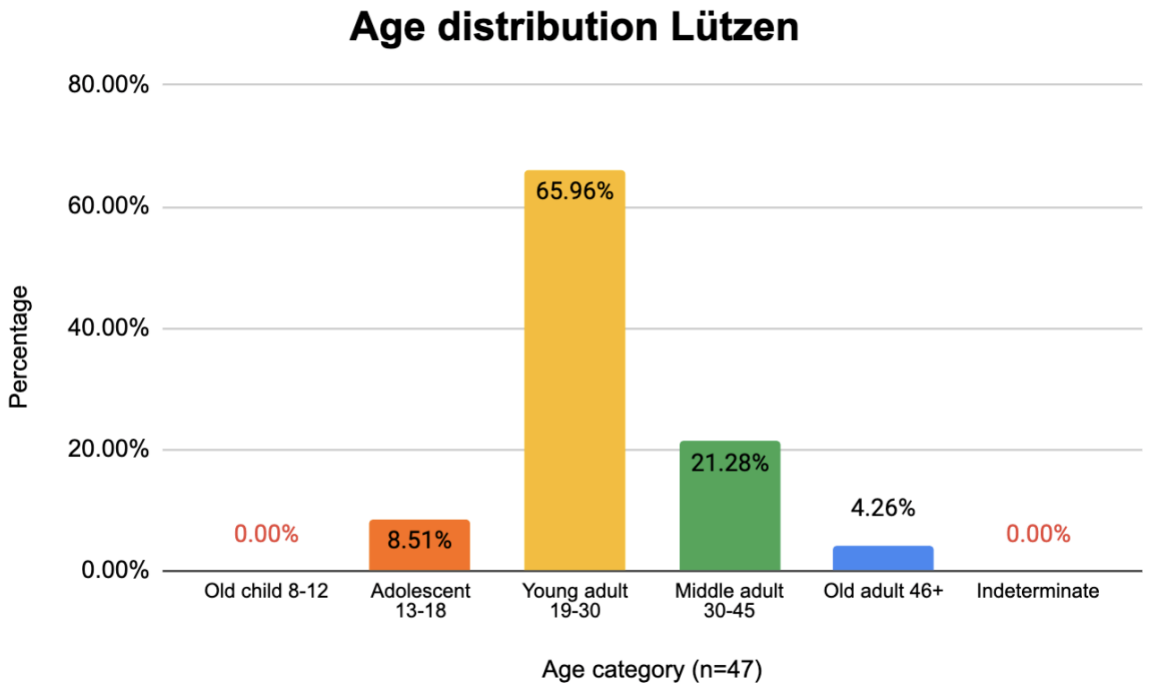

Figure 4.1: Distribution of age in the battle of Lützen (n = 47)

4.1.2 Battle of Towton, England

Out of the 38 individuals found, Thirty-five were estimated to be male meaning 92% of the complete assemblage. The remaining three individuals (7.8%) were analysed as probable males so they were left out of the main age percentage (Boylston et al., 2007). The youngest individual of the collection was between the ages of 16 to 25 years old at time of death. While the oldest individual was over 46 years old at time of death (Boylston et al., 2007). A predominance of individuals, 55.26%, fell under the young adult category, between the ages of 19 to 30 years old at time of death (see figure 4.2) (Nicklisch et al., 2017).

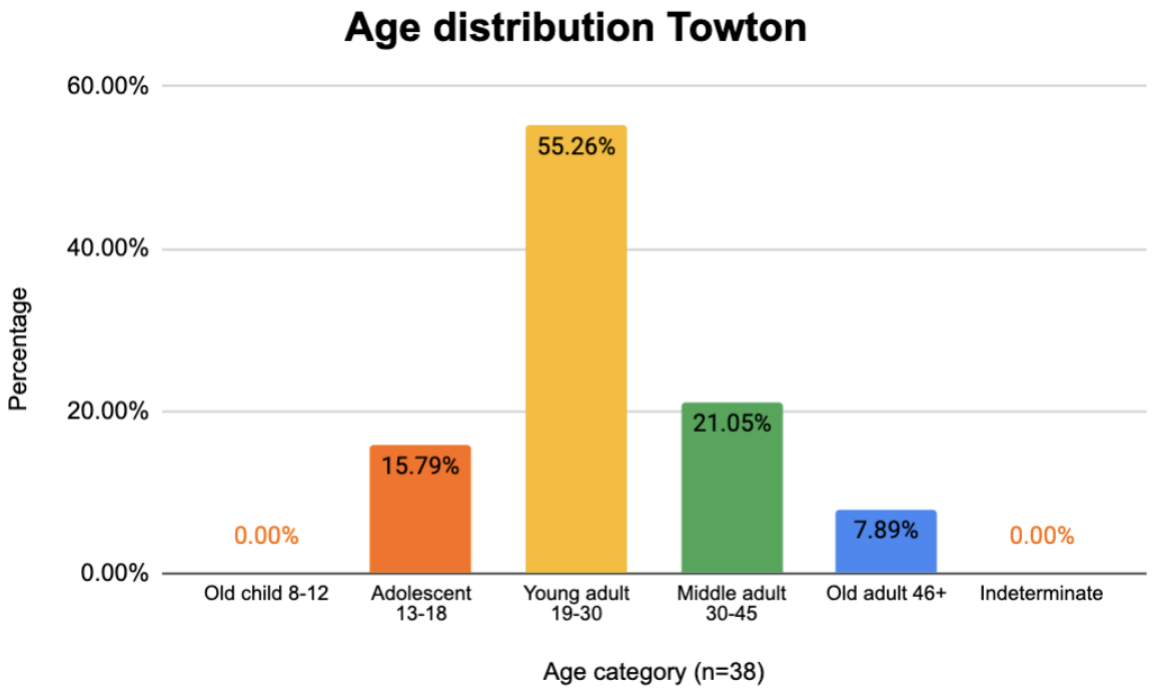

Figure 4.2: Age distribution in the battle of Towton (n =38)

4.1.3 Siege of Alkmaar, the Netherlands

The sex estimation for the individuals in Alkmaar yielded different results. In the larger mass grave, there were 22 individuals with 18 males (81.8%) and four individuals determined as inconclusive (18.2%) (Schats et al., 2013). However, in the smaller grave, osteological analysis showed 5 males (55.5%) 2 females (22.2%) and 2 (22.2%) inconclusive. The use of DNA analysis was able to determine the two confirmed females and determine the sex of two individuals who were of a very young age (Schats et al., 2013).

The youngest individual examined in the smaller grave was between 8-12 years old at time of death, while the oldest individual was between 36-45 years old. (Schats et al., 2013). A majority of individuals in the smaller mass grave were found to be equally adolescents and middle adults both at 33.3% (see figure 4.3).

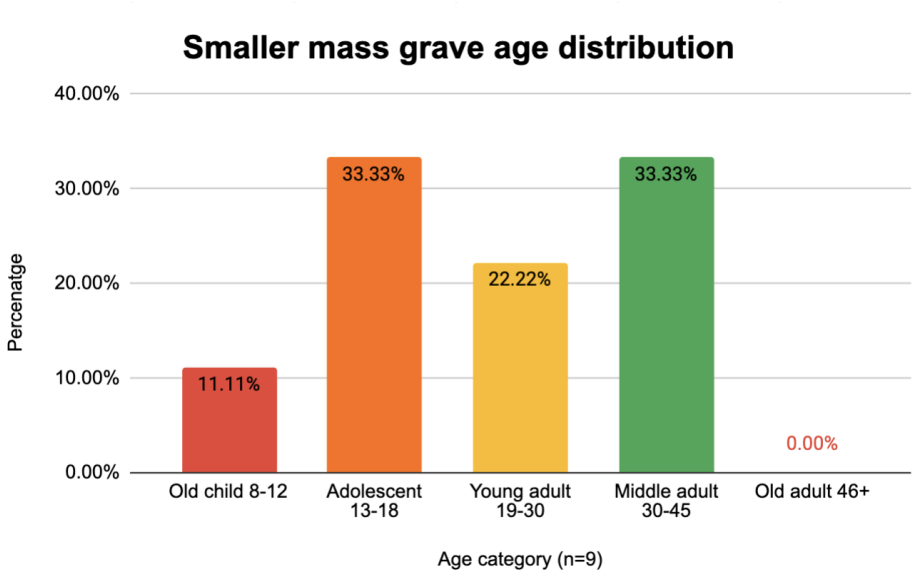

Figure 4.3: Age distribution of smaller mass graves at Alkmaar (n=9).

The youngest individual that was examined in the larger mass grave was between the ages of 16-18 years old at time of death, while the oldest individual was between 36-45 years old. Most of the individuals that were examined in the larger mass grave (59.09%) fell under the category of young adult, meaning between 19-30 years old at time of death. (see figure 4.4) (Schats et al., 2013).

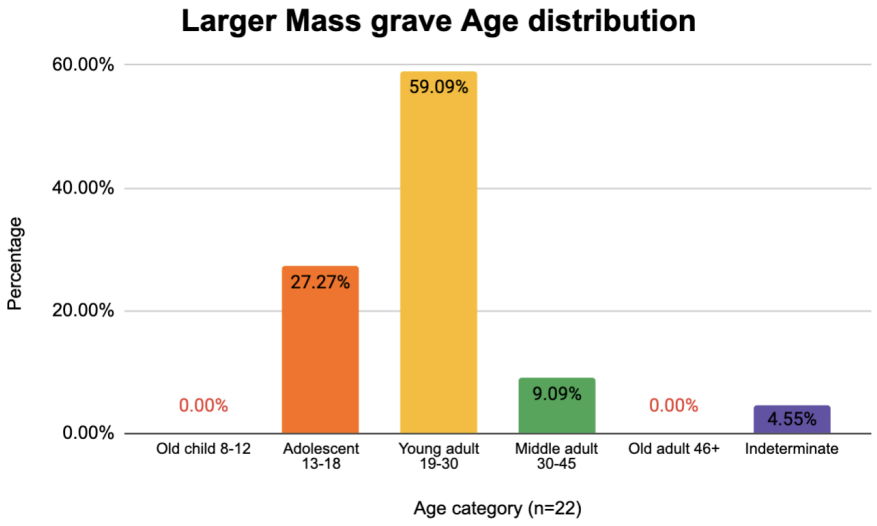

Figure 4.4: Age distribution of the larger mass grave at Alkmaar (n=22).

4.1.4 Battle of Good Friday, Uppsala, Sweden

In total, a minimum number of ~60 individuals were found. The sex estimation in the mass grave of Uppsala shows the better part of males (82% out of the 58 pelvic bones studied) (Kjellström, 2005).

The youngest individual of the collection was between the ages of 14 to 24 years old, while the oldest noted individual was over 46 years old at time of death. Age distribution in the mass grave in Uppsala shows a majority of young adults at 48.61%, this might be higher, however the first section (38.89%) was noted to be within both age categories that I had established, and in order to keep the information as valid as possible both age categories were established for that range of age analysis, See figure 4.5. (Kjellström, 2005).

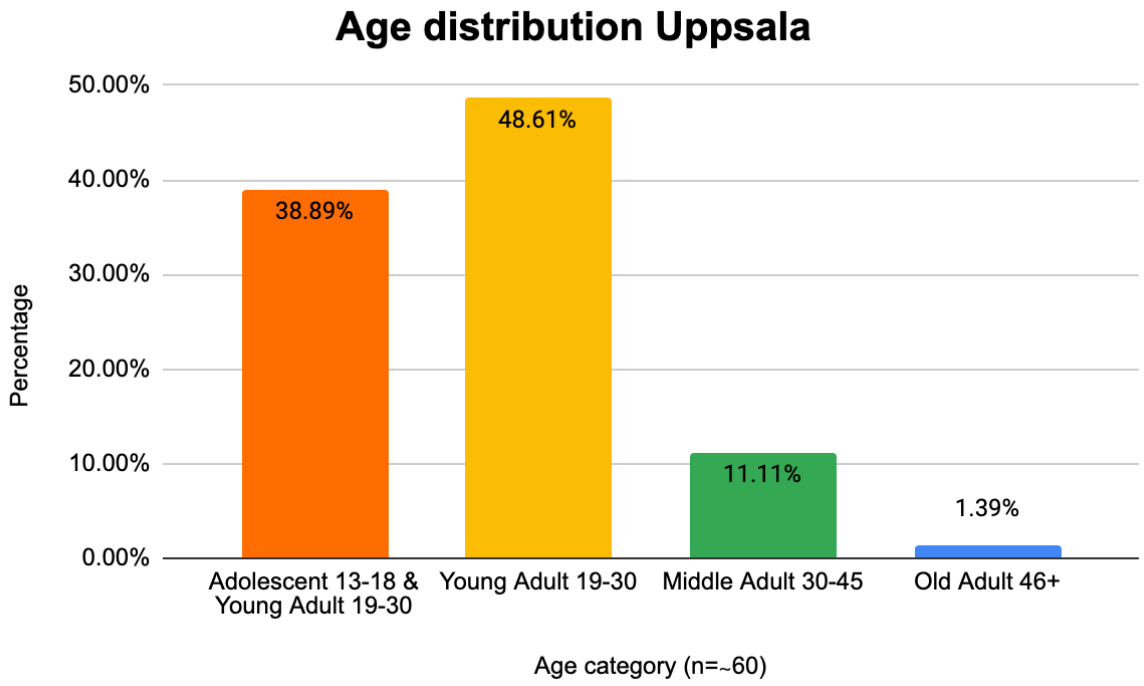

Figure 4.5: Age distribution at mass grave in Uppsala (n=~60).

4.1.5 Comparison

In terms of sex estimation, all sites from this research showed a majority of males, this can be seen in figure 4.6. Towton shows the highest number of estimations with a 92% of estimated males, in comparison to the lowest percentage of males shown in the smaller grave in Alkmaar with a 55% (Schats et al., 2013; Boylston et al., 2007). Comparatively almost none of the sites show any female population at all, in exception for the smaller mass grave in Alkmaar with a 22.2% of females within the collection. Every one of these sites is comparable to each other and they correlate to one another in their tendencies. Both in sex estimation and age at death estimation.

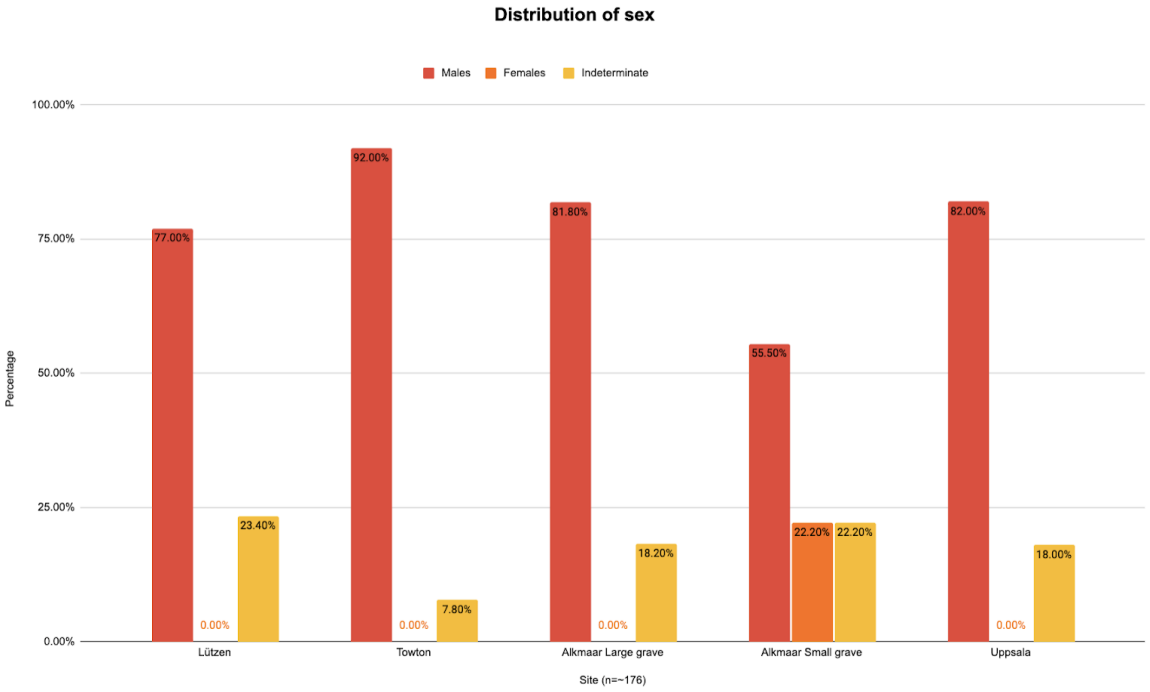

Figure 4.6: Sex distribution (n=~176).

For age at death estimation (see figure 4.7) there is a majority of sites that have a high percentage of their population within the age category of young adult. Lützen has the highest seen percentage of young adults and of any number of individuals in a certain category, with 65.9%, in comparison to some of the other age categories in which the highest percentage goes up to 48.6%. There is congruence of data amongst Lützen, Towton, Uppsala and the large grave in Alkmaar. An exception for this is the results that we get from the smaller grave in Alkmaar. This grave shows the only individuals that go in the age category of older child and has a majority percentage of the population divided within the categories of adolescent and middle adult with a 33.3% each.

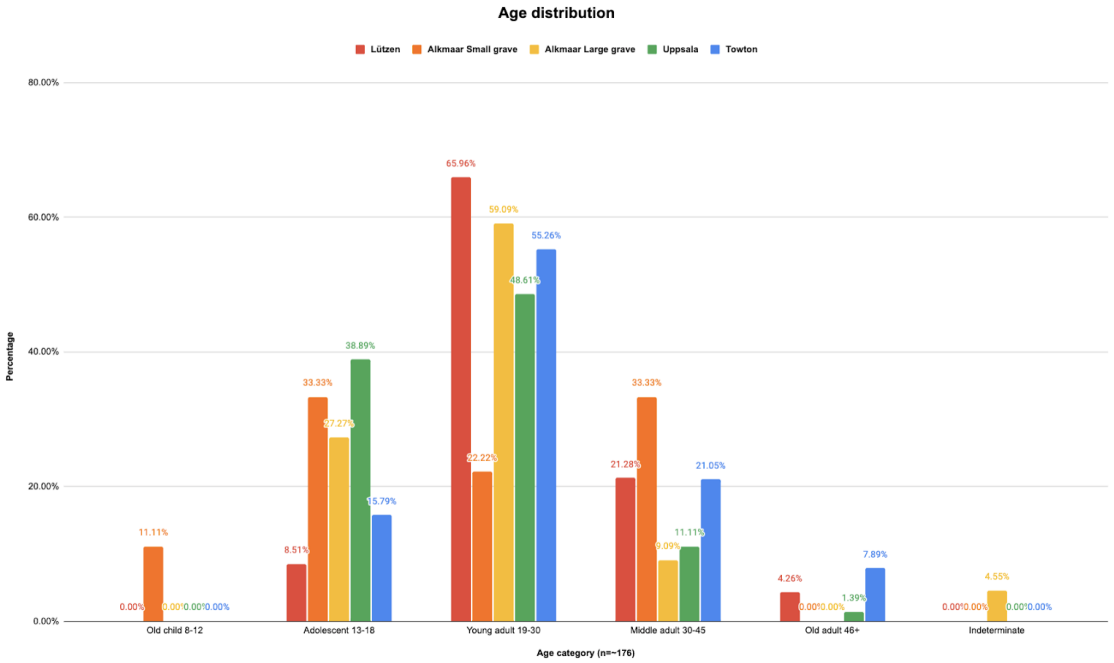

Figure 4.7: Age distribution (n=~176)

4.2 Life: Ante-mortem injuries and occupational pathology

In this section the results for the trauma analysis of ante-mortem injuries will be presented, injuries that happened long before time of death, and that have had time to remodel and heal over time. At the same time, any stress related pre-existing conditions will be highlighted in this section.

4.2.1 Battle of Lützen, Germany

Nicklish et al. (2017) states that in the cranial area there are 16 ante-mortem injuries identified in 12 of the individuals (25.5% of the total population in Lützen). These majority of injuries (53.33%) were concentrated around the area of the parietal and frontal bones and consisted of blunt force injuries (see figure 4.8) such as impression fractures to the vault of the cranium or to the nasal bone area (Nicklisch et al., 2017). 21 individuals evidenced injuries to the postcranial skeleton (44.6% of the total population). Most of the injuries and fractures are located in the hands, feet and long bones (Nicklisch et al., 2017).

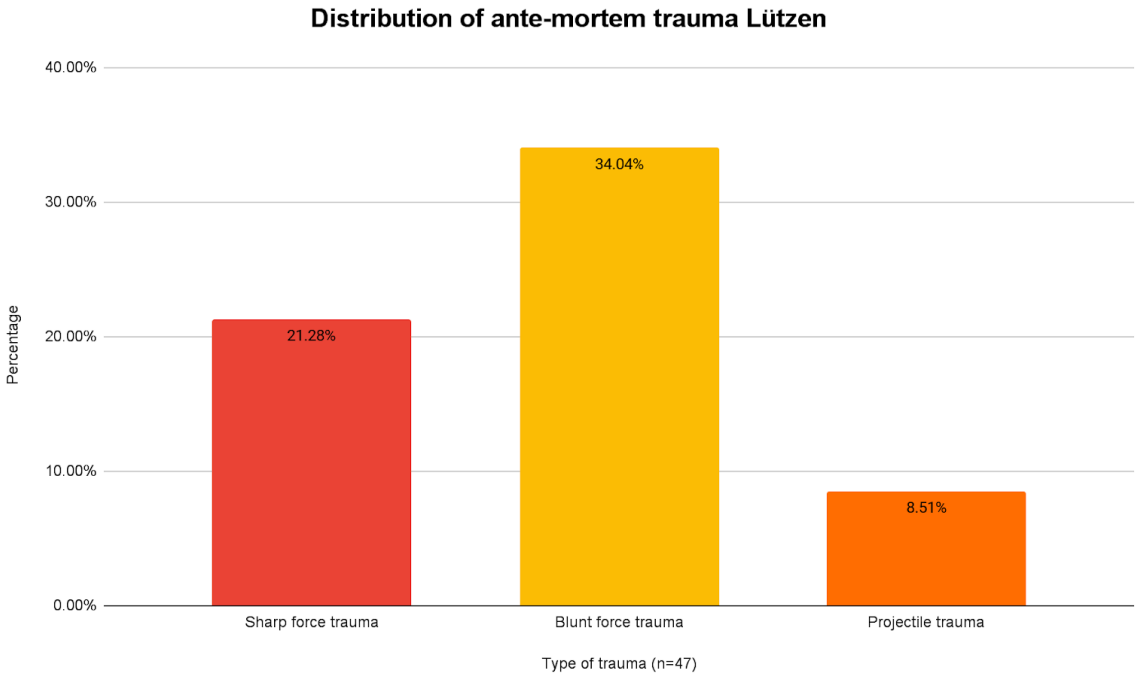

Figure 4.8: Ante-mortem injury distribution in Lützen (n=47).

An example of the injuries mentioned above, are two individuals who evidence fractured lower limbs and two who evidence fractures to the upper postcranial skeleton. Fractures to the lower limbs could be the result of transportation accidents or movement of heavy loads (Nicklisch et al., 2017). While fractures in bones like metatarsals and vertebrae can be described as “healed stress induced injuries' ' or “shoveler's fracture” (Nicklisch et al., 2017 p. 20). These injuries are often due to the act of excess shovelling or walking. There is evidence for joint disorders, but they are not reliable enough to be added into a viable conclusion (Nicklisch et al., 2017).

4.2.2 Battle of Towton, England

Novak (2007) describes ante-mortem trauma identified in 9 of the 38 individuals (23.6%). There are a total of sixteen injuries, of which nine are classified as blunt force and seven as sharp force see figure 4.9. All of these injuries were located in the crania of these individuals (Novak, 2007). One example of sharp force ante-mortem trauma is the individual Towton 16. This individual shows an injury of a blade slashing through the jaw cutting through the third molar and into the area of the corpus of the jaw (See figure 4.10) (Novak, 2007). This injury was classified as ante-mortem as it was concluded to be healed and showed no signs of infection (Novak, 2007).

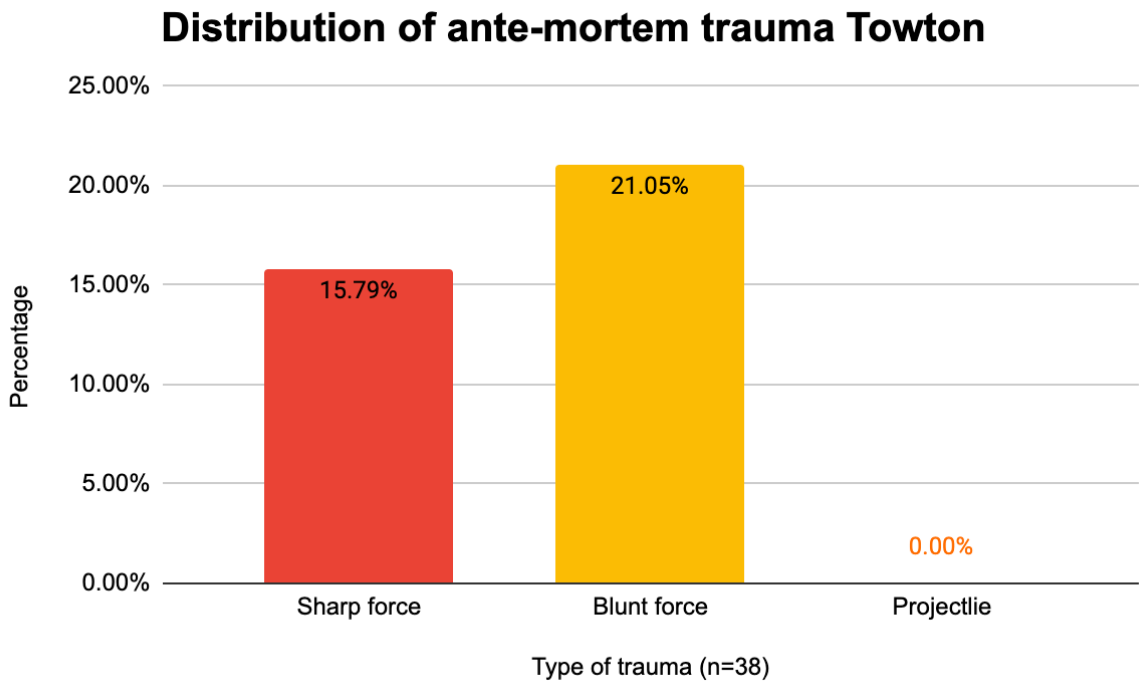

Figure 4.9: Antemortem injury distribution in Towton (n=38)

Coughlan and Holst (2007) explain that there is very little pathological evidence at the mass grave at Towton in terms of occupational pathology or degenerative markers caused by stress. The only notable evidence is the presence of Schmorl's nodes, these were noted in a majority of individuals within the ages category of young adults at a 23.40% (see figure 4.11) which could indicate their lives of high stress (Coughlan and Holst, 2007).

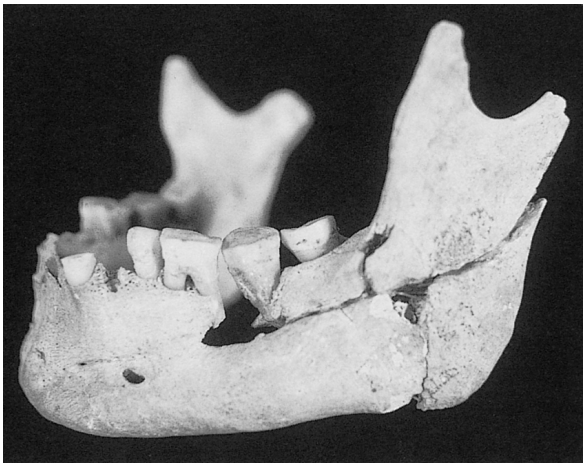

Figure 4.10: Photograph of jaw of Towton 16 (Novak, 2007, p. 95)

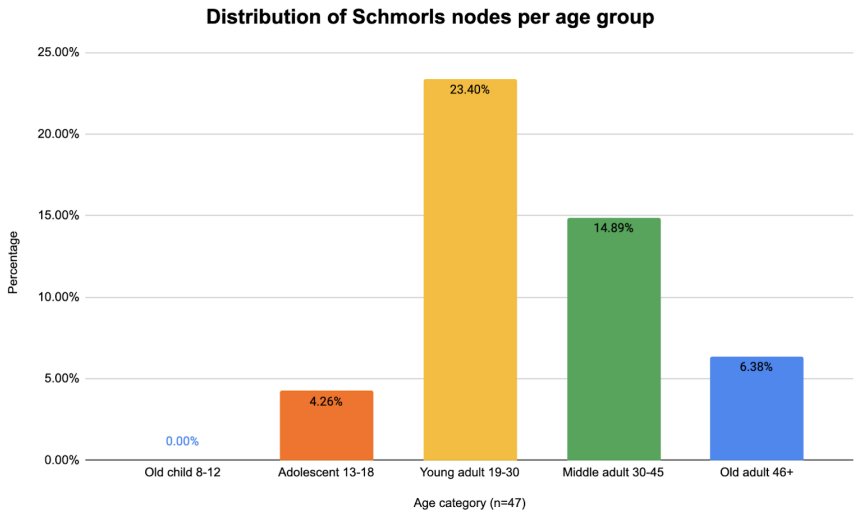

Figure 4.11: Distribution of Schmorl's nodes per age group (n=47)

4.2.3 Siege of Alkmaar, the Netherlands

The larger mass grave in Alkmaar showed individuals who had sustained both blunt force and sharp force trauma to the cranium (see figure 4.12) (Schats et al., 2013). One of the individuals showed a healed impact to the cranial cavity while the other one evidenced a healed blade wound. According to Schats et al. (2013), the latter might have been produced by the impact of a sword. Postcranial, the larger mass grave had three individuals who all showed healed rib fractures. However, Schats et al. (2013) explains that these injuries cannot be fully linked to violent encounters, so they were left behind from the data chart.

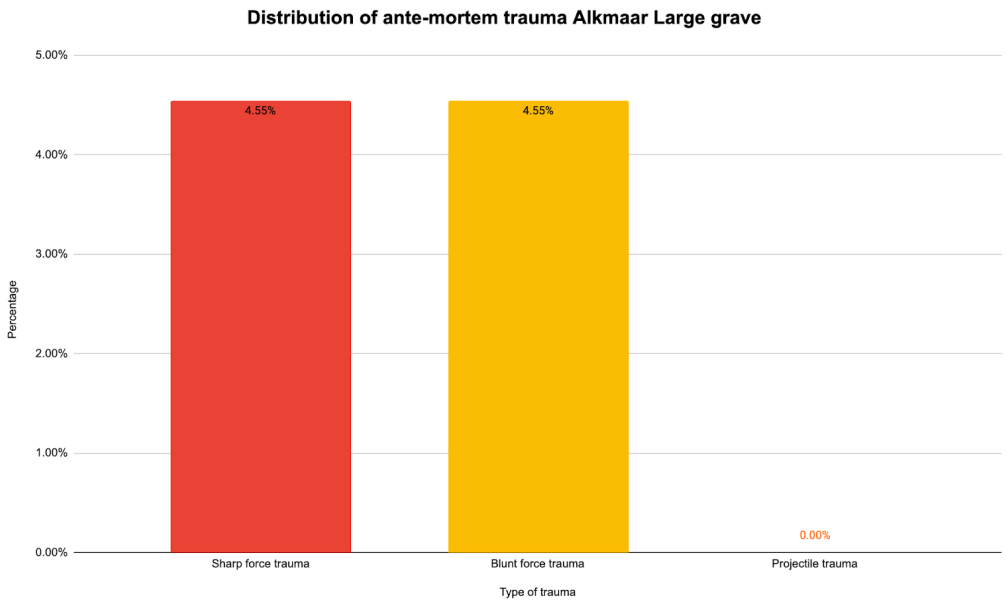

Figure 4.12: Ante-mortem injury distribution in Alkmaar Large grave (n=22)

The smaller mass grave only had one ante-mortem injury (Schats et al., 2013). The individual showed what was likely a defensive wound on his lower arm, specifically in his ulna (see figure 4.13) (Schats et al., 2013). The nature of the healing and the formation of the callus can point to the cause of the injury being a gunshot. However, Schats et al. (2013) states that the healing on the injury is not enough to be able to say if this was done during the siege of Alkmaar.

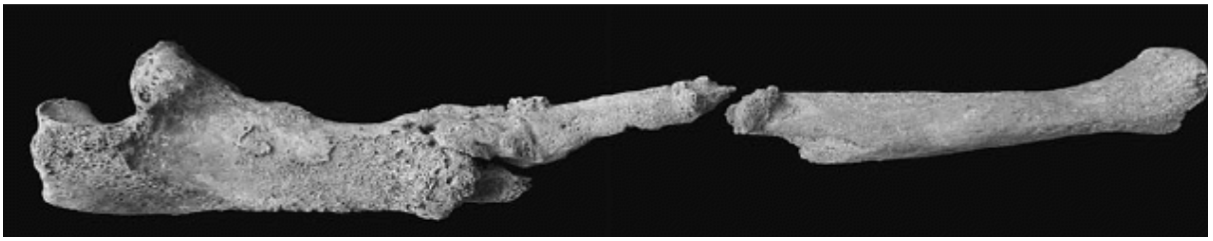

Figure 4.13: Ulna with ante-mortem injury from Alkmaar (Schats et al., 2013, p. 461)

There is evidence of degenerative joint processes in 13 of the individuals in the larger mass grave (59.1%) (Schats et al., 2013). These include markers for both osteoarthritis and Schmorl's nodes (Schats et al., 2013). These markers are often seen in older individuals, but according to Schats et al. (2013) these can also be present in younger individuals who undertake severe physical labour (Schats et al., 2013). In the case of this collection the distribution of the disease with age can be seen in tables 4.1 and 4.2 these can show how in the small grave there is balanced evidence for pre existing conditions, while in the larger mass grave there is a majority of young adults with Schmorl's nodes, with 40.91%.

Table 4.1: overview of pre-existing conditions and age small grave Alkmaar

Small Grave	Age category	n	%
Schmorl's node	Old child (8-12)	0	0.00%
	Adolescent (13-18)	0	0.00%
	Young adult (19-30)	0	0.00%
	Middle adult (30-45)	1	11.11%
	Old adult (46+)	0	0.00%
Osteoarthritis	Old child (8-12)	0	0.00%
	Adolescent (13-18)	0	0.00%
	Young adult (19-30)	1	11.11%
	Middle adult (30-45)	1	11.11%
	Old adult (46+)	0	0.00%

Table 4.2: overview of pre-existing conditions and age large grave Alkmaar

Large grave	Age category	n	%
	Old child (8-12)	0	0.00%
	Adolescent (13-18)	0	0.00%
	Young adult (19-30)	9	40.91%
	Middle adult (30-45)	2	9.09%
Schmorl's node	Old adult (46+)	0	0.00%
	Old child (8-12)	0	0.00%
	Adolescent (13-18)	0	0.00%
	Young adult (19-30)	0	0.00%
	Middle adult (30-45)	0	0.00%
Osteoarthritis	Old adult (46+)	0	0.00%

4.2.4 Battle of Good Friday, Uppsala, Sweden

The mass grave of Uppsala shows that there is evidence of ante-mortem trauma in fifteen bone elements of the minimum number of ~60 individuals (see figure 4.14). Kjellström (2005) describes two crania showing four healed depressed fractures with no signs of infections. While two more crania show evidence of injuries caused by sharp bladed weapons in the parietal and frontal bones, but because of the advanced state of healing of the injury, it is stated that this injury might only have been superficial (Kjellström, 2005). These injuries are described to show a strong similarity with the perimortem injuries seen in the collection. There are no descriptions for any evidence or any attempt to analyse occupational pathology (Kjellström, 2005).

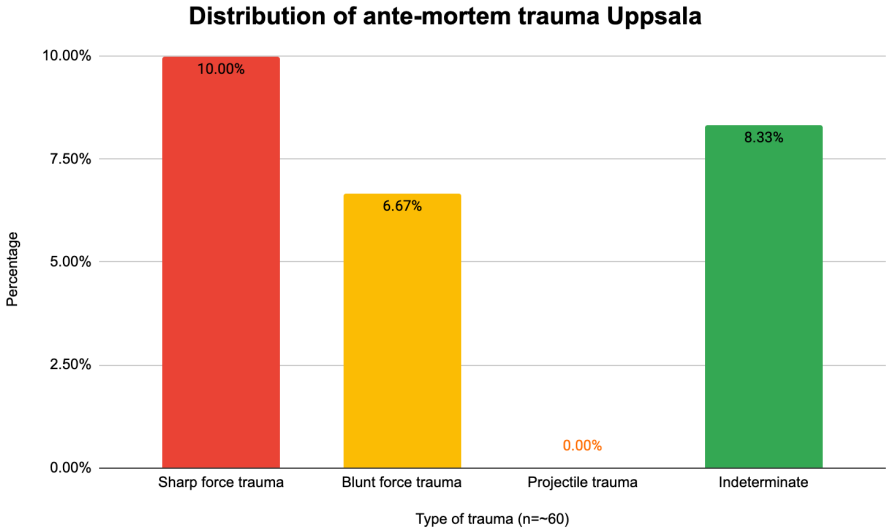

Figure 4.14: Distribution of ante-mortem trauma in Uppsala [Indeterminate value added due to the lack of raw data in source Kjellström (2005)] (n=~60)

4.2.5 Comparison

All sites have evidence for ante-mortem injuries (see figure 4.15). The highest percentage of ante-mortem injuries in any site is at Lützen with 34.04% for blunt force trauma. Comparatively there is a majority of evidence that shows a higher percentage of blunt force and sharp force trauma, each with 66,31% and 51,62% respectively, even though there is also evidence for projectile trauma, the highest level of healed injuries involves human force. The 8.51% of projectile trauma that is noted is in the collections from Lützen, and Alkmaar shows the lowest percentage of ante-mortem trauma with only 4.55% in both blunt and sharp force trauma.

There is one aspect to note which is the 8.33% of indeterminate, this is due to the lack of information on the collection from Uppsala, which did not give information on the missing individuals that did not show sharp or blunt force trauma.

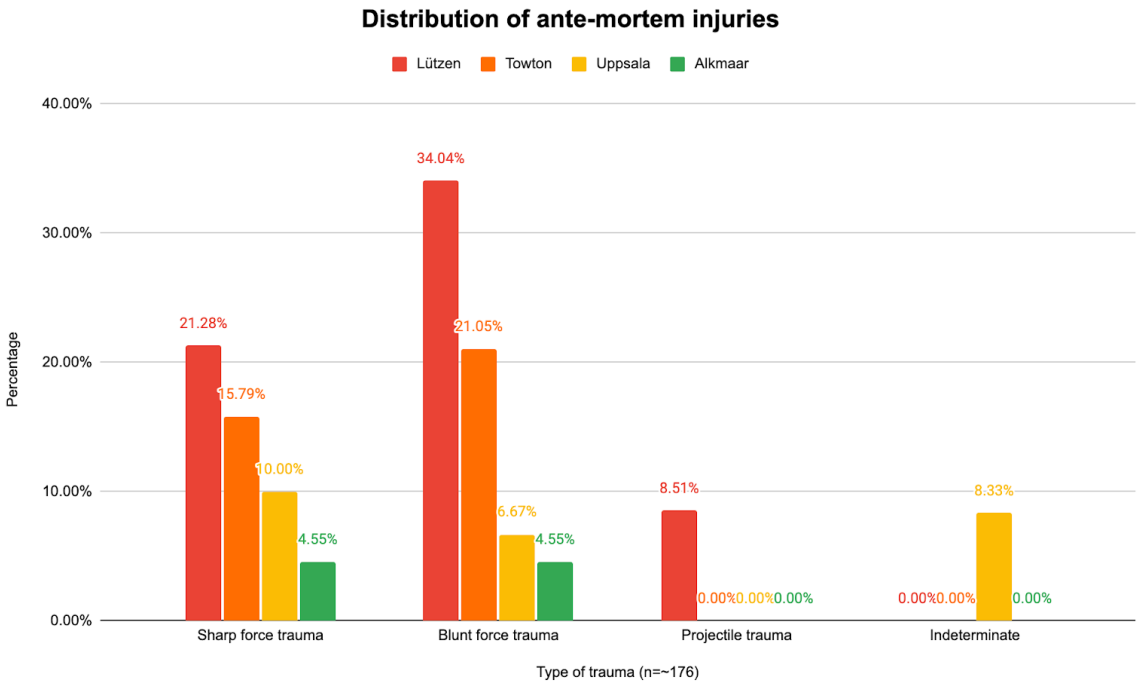

Figure 4.15: Distribution of ante-mortem injuries (n=~176)

In terms of the data presented on pre-existing conditions, some difficulties are encountered for comparison due to the lack of raw data. In Towton and Alkmaar the highest percentage of individuals show schmorl's nodes, therefore figure 4.16 was created in order to present this information, only highlighting this condition, since it would show the most useful information. A majority of these individuals, 11.36% of the whole population between all four sources, are within the age category of young adults. The second highest group that shows this condition is middle adults, with 5.68%. Towton is the collection that shows the highest range of ages that show this condition, with adolescents at 1.14% and old adults at 1.70%. The collections from Uppsala and Lützen, do not mention the exact data for any pre-existing conditions, due to this they were not included in figure 4.16.

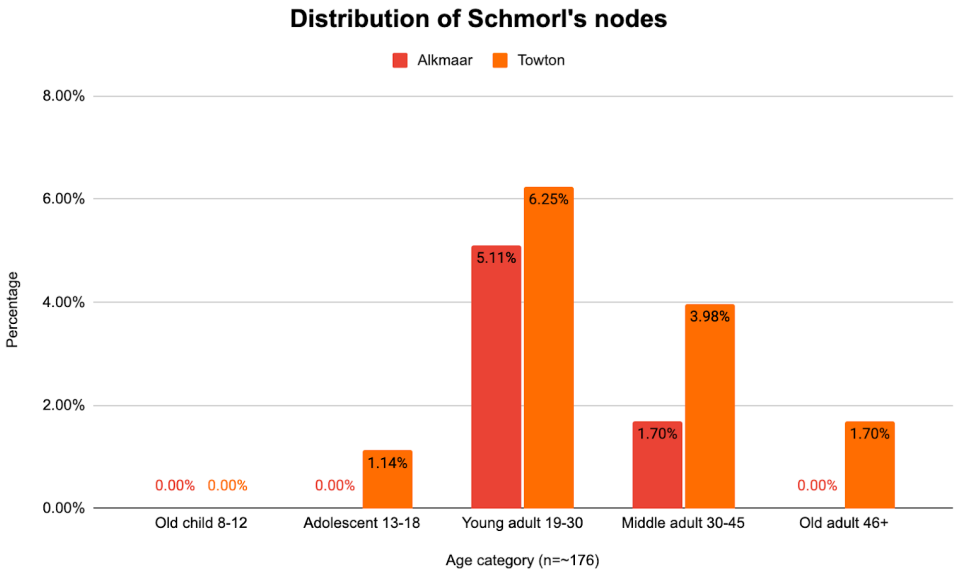

Figure 4.16: Distribution of Schmorl's nodes (n=~176)

4.3 Death: Peri-mortem injuries

In this section the results for the analysis of peri-mortem injuries will be presented. These are injuries that happened very close or at time of death and show no signs of remodelling or healing. After that a comparison will be made between all the sites.

4.3.1 Battle of Lützen, Germany

Perimortem injuries were distinguished in 35 individuals of the 47 total (74.4%), the distribution of these injuries as indicated by Nicklish et al., (2017) are as follows; There is a 25.5% of blunt force injuries, a 19.1% of sharp force injuries, and a 44.7% of projectile injuries see figure 4.17 (Nicklisch et al., 2017).

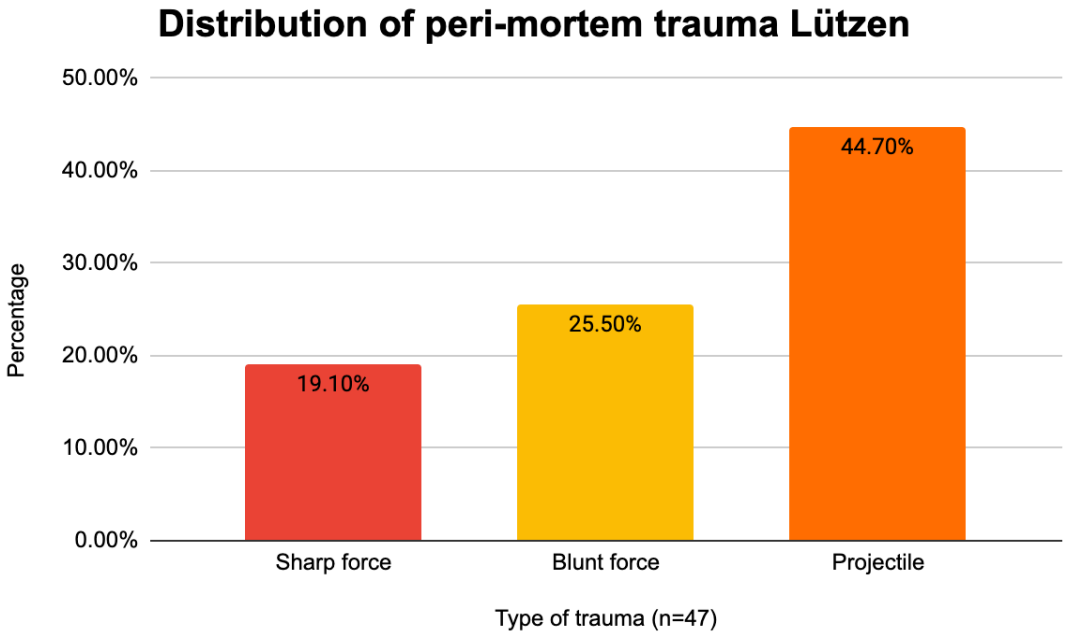

Figure 4.17: Distribution of peri-mortem injuries in Lützen (n=47)

The blunt force trauma was exhibited by twelve individuals with thirteen cranial injuries. Six individuals also evidenced blunt force injuries to the postcranial aspects of the skeleton and a further six may have exhibited injuries, but there are some uncertainties with the diagnosis of these lesions (Nicklisch et al., 2017). The cranial injuries mostly consisted of blows to the jaw and to the anterior aspect of the skull (see figure 4.18). Whereas the postcranial injuries were mostly seen in the upper limbs and ribs (Nicklisch et al., 2017).

Figure 4.18: Photograph of blunt force trauma in Lützen (Nicklisch et al., 2017, p.16)

The sharp force trauma that was identified was present in two individuals who evidenced cranial injuries, and seven individuals with evidence for postcranial sharp force injuries (Nicklisch et al., 2017). The cranial injuries were identified as sword cuts to the posterior aspect of the skull (see figure 4.19), as well as sharp blade cuts to the anterolateral aspect in

the zygomatic bone. On the other hand, the postcranial sharp force trauma was identified mostly in the upper limbs, some lower limb bones and the pelvis (Nicklisch et al., 2017).

Figure 4.19: Photograph of sharp force trauma in Lützen (Nicklisch et al., 2017, p.17)

Nicklisch et al. (2017) describes that in 21 of the 47 individuals there was evidence of gunshot wounds to the head (see figure 4.20). At the same time there were also ten postcranial projectile injuries found in eight of the individuals (Nicklisch et al., 2017). These included the case of two individuals who were shot in two different areas, the torso and the tibia. Other projectile injuries were also found on the pelvic bones and on the spine (Nicklisch et al., 2017).

Figure 4.20: Photograph of projectile trauma to the skull in Lützen (Nicklisch et al., 2017, p.18)

4.3.2 Battle of Towton, England

Within the cranial elements, 113 injuries in 27 crania were identified. These injuries were identified separately as sharp force, blunt force and puncture, each being 65%, 25% and 10% of the total collection respectively see figure 4.21 (Novak, 2007). Sharp force injuries included blade marks, superficial and penetrating cuts (Figure 4.22), blunt force injuries included depression or radiating fractures (Figure 4.23) and puncture injuries include perforations to the skull (Figure 4.24) (Novak, 2007). The distribution and orientation of these injuries show a front to rear aspect to the attack (Novak, 2007). Sharp force was identified mostly in the anterior aspect of the frontal and parietal bones, whereas blunt force could be evidenced in the lateral aspect of the temporal bones and the mandible bones and puncture injuries are found posteriorly and laterally. (Novak, 2007).

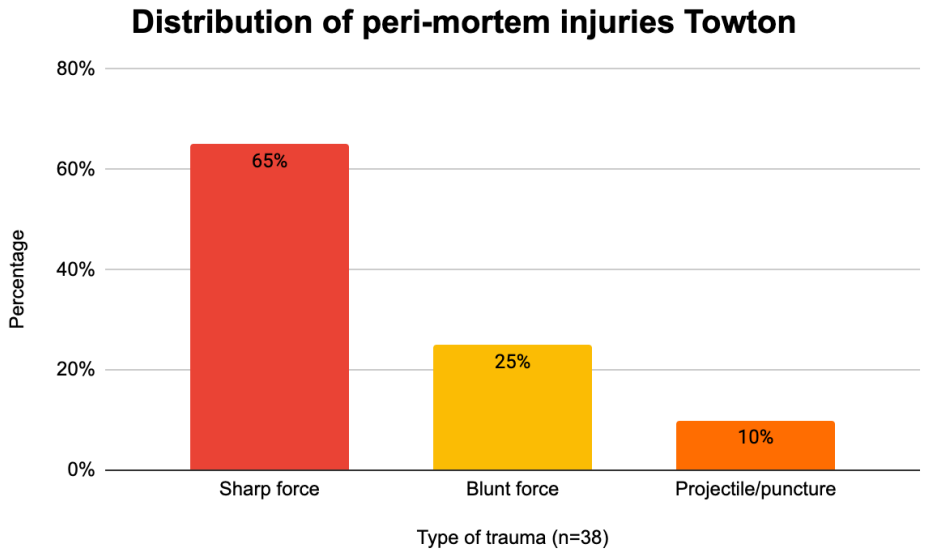

Figure 4.21: Distribution of peri-mortem trauma in Towton (n=38)

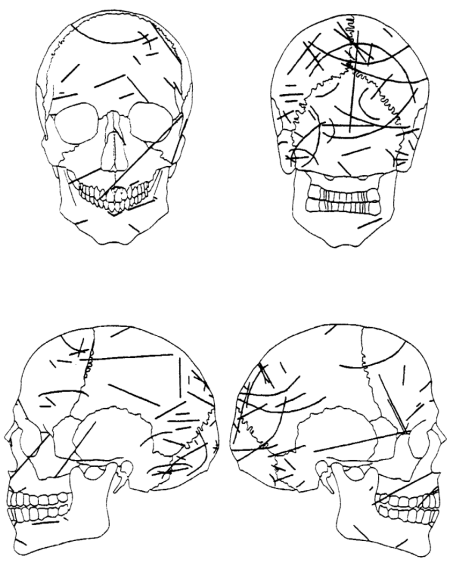

Figure 4.22: Distribution of Sharp force trauma to the skull (Novak, 2007, p. 96)

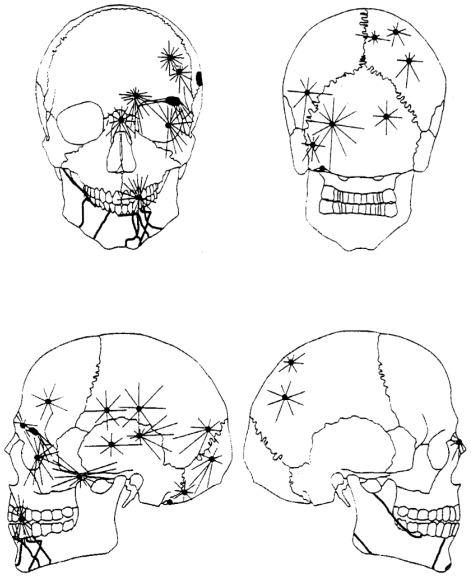

Figure 4.23: Distribution of Blunt force trauma to the skull (Novak, 2007, p. 97)

Towton 25 is an individual that is highlighted in this context, due to the extent of the sharp force cranial injuries he sustained. The analysis shows him to be of the age category Middle adult, meaning between 30-45 years old at time of death. He presents eight different blade injuries to the skull including one injury that is healed. Several of them went through the anterior aspect of his skull (see figure 4.25) (Novak, 2007).

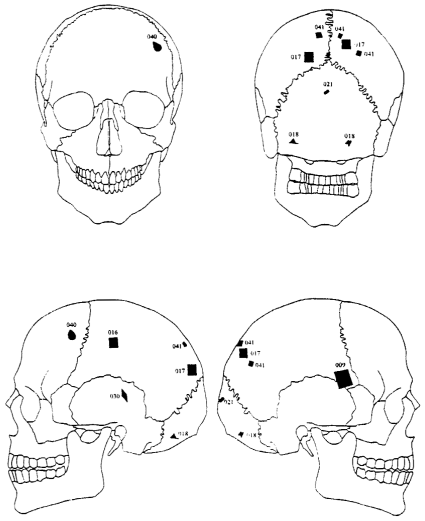

Figure 4.24: Photograph of injuries of individual Towton 25 (Novak, 2007, p. 101)

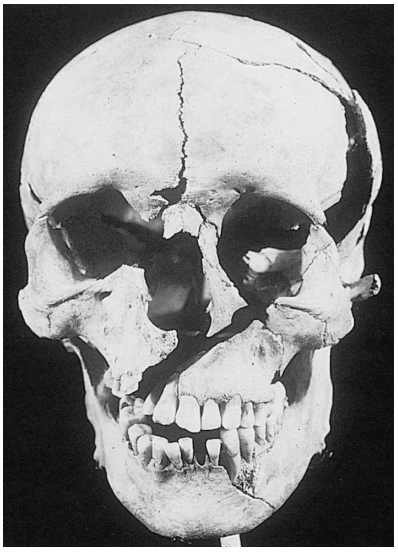

Figure 4.25: Photograph of injuries of individual Towton 25 (Novak, 2007, p. 101)

4.3.3 Siege of Alkmaar, the Netherlands

The perimortem injuries seen in Alkmaar are diagnosed as the result of projectile trauma (Schats et al., 2013). The smaller mass grave showed only two individuals (22.2% of the total 9 individuals) with gunshots to the cranium. This was the same case for the larger mass grave, meaning only 9% of the total number of individuals. In the large grave there is also evidence from blunt force trauma (see figures 4.26 & 4.27). There is no evidence for injuries to the postcranial skeleton in both mass graves of Alkmaar. Schats et al. (2013) state that there were two individuals who were studied further since they had lodged in a bullet in the cranium. The forensic analysis done to these injuries gave the opportunity to establish the exact weapon and calibre used (Schats et al., 2013). The ballistic analysis showed that the most probable weapon that would have inflicted these injuries is an arquebus, however due to the different nature of materials used in the study there are limitations to these results (Schats et al., 2013).

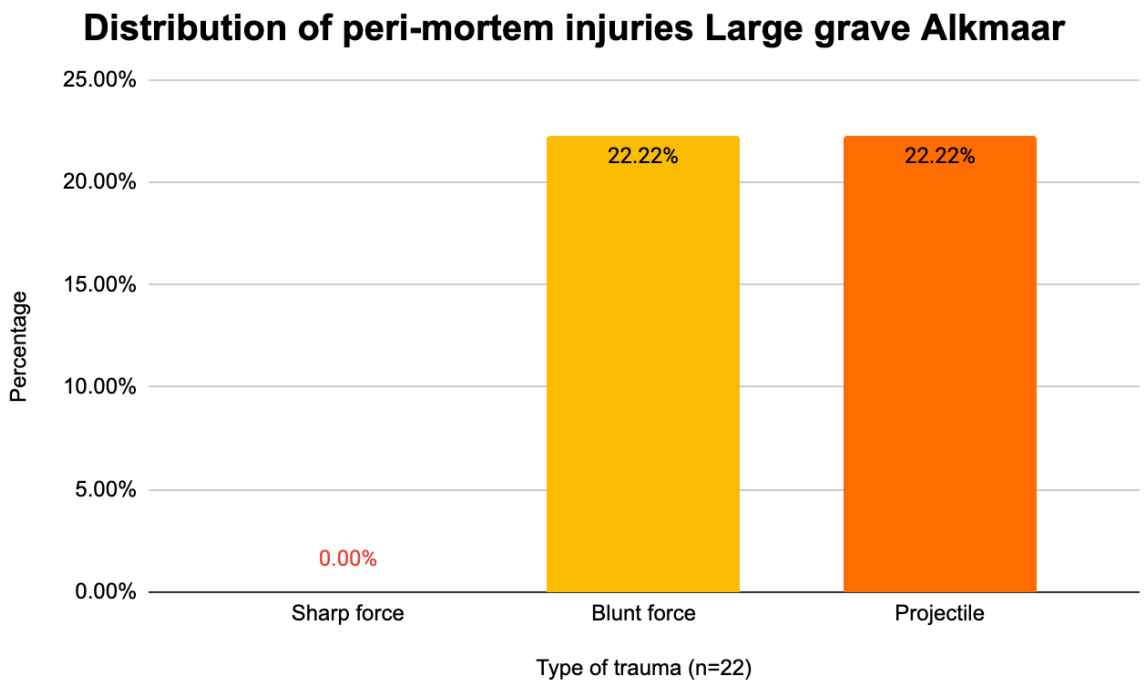

Figure 4.26: Distribution of peri-mortem trauma in Large grave Alkmaar (n=22)

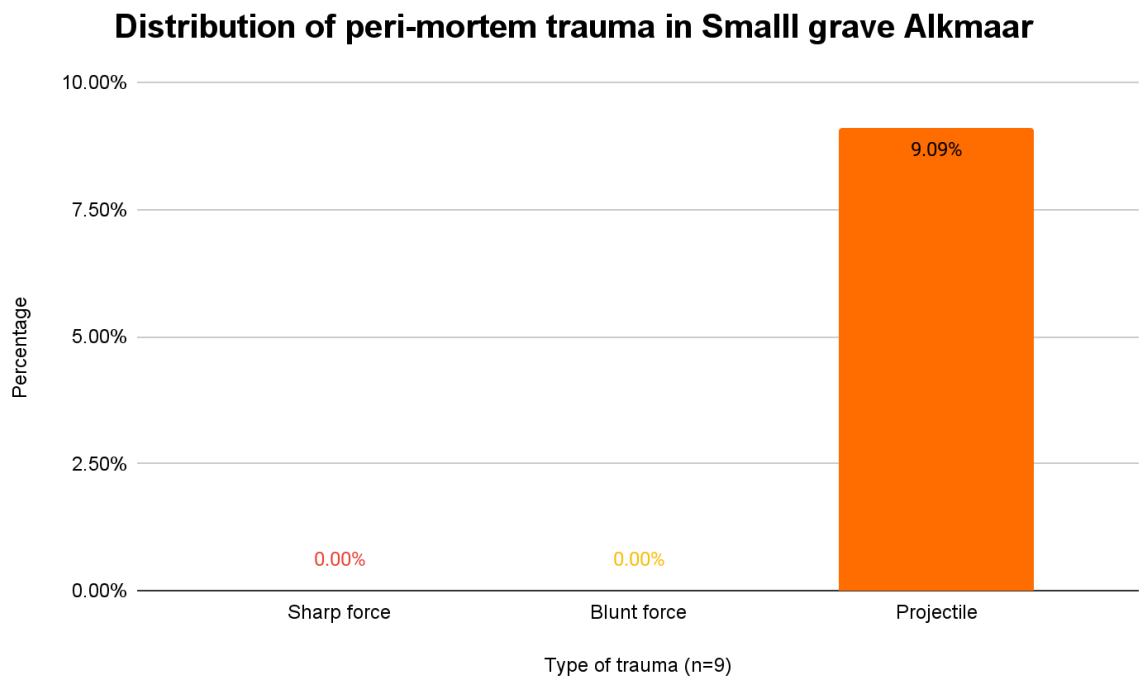

Figure 4.26: Distribution of peri-mortem trauma in Smaller grave Alkmaar (n=9)

4.3.4 Battle of Good Friday, Uppsala, Sweden

Kjellström (2005) notes that the collection of remains from Uppsala only contains sharp force trauma. This is because she notes that there was no intent to analyse any other type of trauma (Kjellström, 2005). Most of the injuries are present in cranial bone elements. There was evidence of 85 blade injuries on 31 skulls of the ~60 individuals (in 51.6% of the total number of individuals). And a further seven injuries were found in 33 of the mandibles from the commingled collection. All of these injuries are described to show no signs of infection or healing. Most of the injuries on the anterior aspect of the skull are concentrated to the right side, whereas the posterior injuries are found mostly on the lateral and inferior side of the skulls (Kjellström, 2005). There is a great specification for orientation of the blows, with the majority being from a superior aspect into the cranial bone (see figure 4.27) (Kjellström, 2005). The post cranial elements of this collection show eleven sharp force injuries that are distributed amongst three tibiae and three injuries identified in the upper arm bones (Kjellström, 2005).

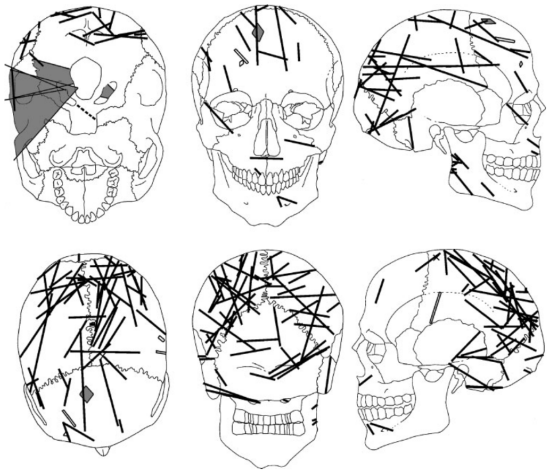

Figure 4.27: Distribution of Blade injuries on the skull (Kjellström, 2005, p.34)

An example of the peri-mortem injuries that were found in this collection is the individual described as the "decapitated man". He is described to have cuts along the C1 to C4 vertebrae, which have smooth surfaces and point to decapitation (see figure 4.28) (Kjellström, 2005). There is no other evidence for sharp force injuries. This can point to what the author concludes as a decapitation from a posterior angle (Kjellström, 2005).

Figure 4.28: Photograph of cut in one of the vertebrae of the “decapitated man” individual (Kjellström, 2005, p.38)

4.3.5 Comparison

The overall distribution of peri-mortem trauma can be seen in figure 4.29. There is a clear trend amongst each of the different sites. Sharp force trauma is distinguishably high in Towton and Uppsala, with 41.48% and 48.30% respectively. Projectile trauma is also seen in a majority, as it is the highest evidenced in the grave in Lützen with 18.18%. One exception that does not follow the same pattern as the three sites before is Alkmaar. In this site the division between two types of trauma is equal, both for the large and small grave there is a balance of 1.14% for blunt force and projectile trauma. This is also the smallest percentage of peri-mortem trauma that is present between all four collections (Novak, 2007; Schats et al., 2013; Kjellström, 2005; Nicklisch et al., 2017)

One thing that must be noted, is that the results that have been presented in this section are derived from the original sources, where there may be information missing. However, the best interpretation of the available data was carried out in order to use this information for the purpose of this research. This can aid in the answer of why this happens, and if there is any reasoning for these differences that goes beyond lack of data.

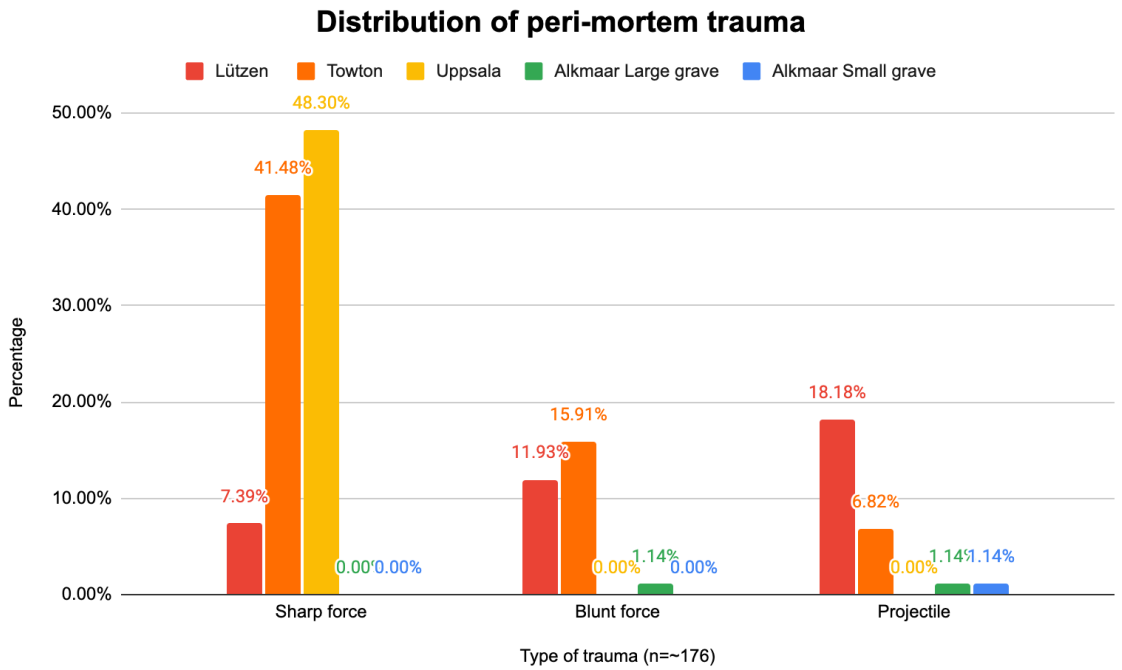

Figure 4.29: Distribution of peri-mortem injuries (n=~176)

5. Discussion

In this chapter, a discussion and interpretation of the results previously presented will be done. This will be separated into the three main themes, Demographics, where the aspects of sex and age at death will be discussed, Life, in which the ante-mortem trauma and pre-existing conditions will be discussed and Death where peri-mortem trauma will be included. Each of these paragraphs highlight important interpretations from the results while also using information from the previous chapters of this thesis.

5.1 Demographics

With all the collections that have been studied in this thesis, the authors constantly compare each collection to each other. This can help further with the answer to the research question, as this aspect of compatibility can create a fuller picture of what it was like to be a soldier in the late medieval and early modern eras. In terms of sex and age at death estimation, the comparison that can be made between them and the implementation of the results with the historical and conceptual background can help understand even more how it was to be a soldier in times of warfare in the late medieval and early modern periods in North-western Europe.

In all the studied sources, the sex estimation derived a balanced result. A majority of males in every collection can demonstrate a lot of important factors that this thesis had previously established in chapters 2 and 3, such as the predominance of male volunteers to join rural armies or to sign into the military (Bell et al., 2014). These are all congruent results that come from different areas of Europe and seeing them correlate to each other can give a lot of information about common patterns in the societal context of warfare in these different territories.

An overall percentage of 77.2% males across all four collections is a number that correlates with the historical background of medieval warfare (Tallet, 1992). There was predominance for male volunteers in Europe in time of warfare, and often conscription was made only available for males in order for them to be able to join the army (Bell et al., 2014). The comparison that is done within this data and the similar results of different territories can show that indeed there was a predominance for males all around Europe, and it is not just secluded to only one territory.

One potential exception for this is the data that is found in the smaller mass grave in Alkmaar. The two individuals who are confirmed females put a pause on these conclusions, although Schats et al., (2013) states that this grave may not be related to the soldier grave, because of the burial method and remains of wood that are found on site (Schats et al., 2013). It must be noted that the presence of females can also be related to historical context. The Dutch rebel

army was made up of rural populations and exiled members of society, so there is a possibility for females to be involved in the fighting as well, but this needs further confirmation.

The age at death estimation of almost all of the collections revealed a slight majority of young adults with a 33.5%. All of the collections with the exception of the smaller mass grave in Alkmaar show a majority in percentage of individuals that fall within that category, what this reveals is in correlation with what is historically known, that young people would be more susceptible to join the army, an would be encouraged to do so by society as well (Bell, 2014). The presentation of these results can help identify the predominance for younger individuals to be drawn into becoming a soldier.

The example of the smaller mass grave in Alkmaar shows that there is an equal number of adolescents and middle adults with 33.3% each. This is not so far off from what the data is for the other four collections, however this information can be of use in order to determine whether the smaller grave was indeed related to the siege or not. An age category that was not seen in any other collection other than Alkmaar is the presence of an older child, meaning they were younger than 12 years old at time of death, this in accordance to the historical data would have been a much too young individual to take part in military training, but at the same time, there is a possibility that these individuals are civilians who did fight but died early on in the process of the siege (Schats et al., 2013).

A comparison between all of the results from the collection can demonstrate that there is a common occurrence of both young adults and middle adults. Both of these are in par with the ages that are commonly related to the military training, the younger individuals being new additions to the fight while the middle adults could be individuals who had been in a previous fight and still had enough health to join a second fight, meaning that they would be experienced soldiers (Tallet, 1992).

The data that is presented within the categories of age at death in each of these collections can help further understand how young a person could be while still living in a societal context of conflict. The similarities between the data are vital in our understanding of the bigger picture for violence and how territories far apart still followed the similar patterns.

The comparison of the demographic data that is presented in these can help in the understanding of the social context of violence at a personal level. What was common during that time? How can a young man be subjected to join the military if there is a vast majority of the other young adults that are joining as well? These are questions that the data seeks to answer. Knowing now that the results of the demographic data and its comparison can even further help us understand the content of violence in late medieval, early modern Europe.

5.2 Life

Ante-mortem injuries can be seen in all of the collections that have been used in this research. The only exception is the smaller grave in Alkmaar; however the large grave does show evidence for ante-mortem trauma (Schats et al., 2013). Each of the collections had a majority of one type of trauma over others. In the case of Lützen and Towton, there is a majority of blunt force ante-mortem trauma with 34.04% and 21.05% respectively, in Uppsala there is a majority of 10% in sharp force trauma, and in the case of Alkmaar there is an equal 4.55% of evidence between blunt and sharp force trauma. When these are compared together, it can be seen that blunt force is common in ante-mortem trauma, this could be in relation to the training methods and the strenuous lives that a soldier would have led, since a fracture of a heavy blow would have been easier to live with than with an open wound.

One example of the extent that violence could reach outside of the battlefield is the case presented by Nokav (2007) in Towton. Individual Towton 16 presents with extensive healed trauma. The action of slashing through the jaw of a person is not an easy thing to do, however in the case of individual Towton 16 from the age category of old adult, he evidences a blade wound that slashes through his jaw, and shows signs of remodelling (Novak, 2007). This can be evidence of the extent of violence that a soldier or just an individual would go through in their day to day lives. Revealing more information about the context in which these individuals lived. If this is compared to the ante-mortem injury evidence from other collections, one that is similar is that of the ulna of Alkmaar, this bone element presented with bone remodelling in what is assumed to be a gunshot injury (Schats et al., 2013). A comparison between these injuries can evidence even further that violence could reach very high levels in two very different territories, and how individuals had to live with violent acts in their daily lives.

At the same time, the context of these individuals needs to be taken into consideration. Hard labour markets and ante-mortem injury would have not been common only for a soldier, but it might have also been evidenced in a farmer who also had hard work conditions during this era (Faccia & Williams, 2008; Redfern, 2017). The last statement correlated with the collection from Uppsala, the army that fought the Danish mercenaries was mostly farmers who could have had a vast amount of healed injuries that had nothing to do with violence (Kjellström, 2005). It can also be applicable to the collection from Alkmaar, since the fight was not hands on and the nature of the conflict was a siege meaning that there would have been no previous preparation. At the same time, horses, heavy guns and gun kickbacks could have been just as damaging as an attacker in battle (Nicklisch et al., 2017). This is something that could be applicable to the mass grave at Alkmaar. Schats et al. (2013) describes cranial trauma and postcranial trauma to the ribs (Schats et al., 2013). Which may point to a possibility of harsh training or a harsh lifestyle, a possibility could be that in training this kickback causes a break in ribs that was later fixed with time. However, this is a preliminary interpretation, which needs more support for it to be reliable.

The study of antemortem trauma can be crucial in the interpretation of the influence of context on the life of an individual. These healed injuries are the entry way into not only personal lives but also into a higher understanding of the societal context.

Pre-existing conditions and stress related trauma can reveal more about an individual's life before they stepped into the battlefield. Each one of the collections used in this study, with the exception of Uppsala, note some form of pre-existing condition that could reveal more about the life of the population before the battle . In both Towton and Alkmaar there is a mention of Schmorl's nodes, this condition is evidenced in 23.40% of the population in Towton and 40.91% of the population in Alkmaar. On the other hand, in Lützen, there is no mention of that specific condition but there is evidence for what are known as stress fractures. The only exception in this study is the collection from Uppsala, in which the author states that there was no intent to look for any pre-existing conditions (Kjellström, 2005).

The evidence for Schmorl's nodes in both Towton and Alkmaar is significant because of the relationship that it has with age at death. Usually Schmorl's nodes will be seen in an individual of older age, this is because the degeneration of the intervertebral disk can cause it to prolapse into the vertebrae (Faccia & Williams, 2008). However, in both collections the majority of the individuals who evidenced these conditions were young adults. Meaning that these individuals must have been involved in tremendous amounts of stress and heavy labour. This is important, because the evidence for pre-existing stress related trauma in the individuals of younger age are big markers for the possible training methods (Schats et al., 2013).

This is also the case for the stress related injuries that are mentioned in the collection in Lützen, even if they are mentioned briefly they can be added into the interpretation because a shoveler's fracture would involve an immense amount of labour (Nicklisch et al., 2017). Meaning that it has the potential to aid in the interpretations based on the appearance of Schmorl's nodes when they are compared together, since both conditions are related to high levels of stress (Faccia & Williams, 2008). These types of conditions can reveal a lot about the past life of an individual, because these are not gained by one blow, but are the result of a long time of physical endurance imposed by their context, which leaves a mark on their remains until death.

5.3 Death

Peri-mortem injuries are one of the key elements to the study of death on the battlefields. All of the collections used in this research have evidence for peri-mortem injuries, but they differ in the exact percentages and distribution amongst each other. Uppsala and Towton show a majority of sharp force trauma with 48.30% and 41.48% respectively, and Lützen has a large number of individuals evidencing projectile trauma at 18.18%. Alkmaar however, has a balanced 1.14% of trauma distribution amongst the smaller and larger mass grave in both blunt force and projectile trauma (Nicklisch et al., 2017; Schats et al., 2013; Novak, 2007; Kjellström, 2005). The importance of peri-mortem injuries is that they can aid in the

understanding of the manner of a person's death in a context of violence in different territories, and by comparing them the information reveals patterns that follow across different territories in Northwestern Europe.

A comparison between the assemblages from Uppsala, Towton, Alkmaar and Lützen can reveal the nature of each of these combat methods and how they can relate to each other. A majority of projectile trauma would suggest that most of the fighting process was done from a distance, while a majority of force trauma suggests that the fighting was at closer range. Keeping this in mind, noticeable similarities are noted between Uppsala & Towton, and Lützen & Alkmaar. The first two share a majority of sharp force trauma, meaning that both of these battles point to close range combat. Whereas for the latter two, the high percentage and presentation of projectile trauma shows that the fight was most likely done at long distance range, this would correlate with what is seen in Alkmaar, according to the nature of a siege (Hoskins, 2018).

The importance of recognizing both these methods of combat is important, in the study of the nature of killing within a specific context. The concept of dehumanisation of an individual is a vital factor in battle, and becomes not as necessary in long distance combat. This is because a person creates a barrier between them and the enemy, in which they allow themselves to kill (Braender, 2015). This, however, is not the case for face to face combat, Tallet (1992), states that face to face combat requires a dehumanisation of the enemy in order for a person to be able to kill. This concept is believed to be easily applied in the context of violence, because survival depends on the ability to kill others (Tallet, 1992).

An example of this concept within the research is individual Towton 25, eight blade injuries to the face is not something that is commonly seen, and sharp force trauma is most likely done in close combat (Nicklisch et al., 2017). Meaning that an individual would have had to have a great amount of force in order to slash through a skull, this shows just how violent the context of a battle can be, since multiple stabs can mean that there is a feeling and emotion of hatred behind this killing caused by the dehumanisation of the enemy in battle (Braender, 2015; Redfern, 2017).

The idea of close and long distance combat when placed into a comparative perspective can aid in the understanding of manner of death, and, when added to an interpretation of demographics and ante-mortem injuries, it can give the complete life history of the population of individuals. The peri-mortem injuries are the last stop that led to the understanding of death, and the comparison of all of these sites can show us more about the differences in the manners of death and life of an individual.

5.4 Conclusion

Based on the interpretations that have been derived in this chapter. It is noted how the comparison of all of these aspects can help build an even bigger picture of what it is like to be a soldier in the late medieval and early modern eras.

Both in sex and age at death estimation reveal that there was a tendency for young males to be present in battle (Nicklisch et al., 2017; Schats et al., 2013; Novak, 2007; Kjellström, 2005). There was a predominance for stress related pre-existing conditions to exist in younger adults rather than the normal distribution of older individuals, and the presence of antemortem injuries as violent as Towton 16s can further reveal the extent of violence that was experienced in these societies (Novak, 2007). Finally, the entrance of peri-mortem trauma can help distinguish the overall nature of the combat itself, by pointing to the type as well as the extensive injuries of Towton 25. All of these conclusions aid in the understanding of the life of a soldier, and they all together come in to be able to demonstrate that there are patterns that are not only common for one territory but that are present across Europe. This was one of the goals of the thesis, in order to use these sites together to build a basis for the study of life histories of individuals at war.

6. Conclusion

This thesis aimed to do a comparative study on four different sites from North-western Europe in the late medieval and early modern eras in a context of warfare. This was done by analysing the data presented by the examination of human remains from four different battlefields. The four sites that were chosen were the Battle of Lützen grave in Germany, The Battle of Towton grave in England, the Siege of Alkmaar graves in the Netherlands and the Grave from the Battle of Good Friday in Uppsala, Sweden (Nicklisch et al., 2017; Schats et al., 2013; Novak, 2007; Kjellström, 2005). The data chosen in the comparative analysis done in this thesis was the demographic data of sex estimation and age at death, the ante-mortem and peri-mortem injury evidence, and any data on pre-existing conditions present in the remains. By comparing these the main research question and the following sub questions can be answered.

This thesis has also presented and introduced the concept of bioarchaeology of violence and conflict, as well as presenting the historical background surrounding the study of human remains in a warfare context. The use of these concepts will come into play when answering the questions presented below, this being since the comparative study has to be completed by using the contextual data in order to see if there are any significant similarities between the data presented by these sources, that could ad in the further understanding of life histories of soldiers in the late medieval and early modern eras.

In this chapter the answer to all the sub questions and the main research question will be presented. This will be done with a basis on all of the information presented in the previous chapters, all of the background information, historical context and the data results as well as the interpretations from the discussion. There will also be a section on opportunities for future research in order to present how this research could be improved into the future in order to build more into the study of soldier life histories.

6.1 Subquestions

6.1.1 Subquestion 1: Demography

What are the demographic patterns (sex and age-at-death) of the skeletal collections and what differences can be observed when the different collections are compared?

The demographic patterns that were shown in these collections were consistent throughout. All of them show a majority of males. The only site in which there is evidence for females in the smaller grave in Alkmaar, due to the burial method that is noted and the presence of wood in the grave, it is not fully assured that this grave was related to the siege of Alkmaar. However due to the historical context, this could still be the case, since it was a siege and the

Dutch rebel may consist of exiled and rural civilians there is a possibility that women were part of this fight.

The pattern of age at death is similar in all the collections. All of them have a higher percentage of young adults, between 19-30 years old at time of death, followed by middle adults, 30-45 years old at time of death. This is consistent with the historical context of medieval warfare, seeing as it was usually young men that were led to join the army.

However, two collections show a percentage of individuals that go beyond what is seen in the other sites, in the small grave in Alkmaar a percentage of the population was of the category of 'old child'. This is the only collection that shows an individual of that age, and compared to the other collections and their burials, there is a strong possibility that this is due to the difference in burial method of the smaller grave in Alkmaar, which has been mentioned previously. The other collection that shows a wide range of age categories present is the grave at Towton, there is a high percentage of old adults, this could be related to the historical context of the battle seeing as how the Wars of the Roses were battles that were continuous and older members of the population would still fight. These two types of out of range age categories can show the influence that warfare had in a society. An age distribution that is very wide can show that a lot of people were involved in the fight, as it is the case with both Towton and Alkmaar, but at the same time the lack of younger individuals can also reveal an aspect of society of being old enough to go to war. And being strong enough to withstand the harsh environment that were these battles.

When these two categories are combined new knowledge about the social context is revealed. The sex and age patterns of a society are important in the understanding of life histories. Sex is key to the interpretations that are related to the historical context since this majority of men does fully correlate with what is expected of all of these sites. Age at death also correlates with the historical expectancy for the results and can show that all of these sites are similar to another and thus seeing if the life histories of the individuals from these different territories are similar as well.

6.1.2 Subquestion 2: Life

Which pre-existing stress related conditions can be observed and what do these reveal about the life history of the victims.

The study of pre-existing conditions was done in two out of the four collections that have been studied in this thesis. Towton and Alkmaar both studied the remains and recorded data on the conditions that were seen in the individuals (Schats et al., 2013; Coughlan & Holst, 2007). For the purposes of answering this sub question, this thesis was based on the most prevalent one, which was Schmorl's nodes. This condition was notoriously seen in a majority of young adults. This information can reveal an aspect of the life of the individuals that is not looked at commonly. Schmorls is most commonly seen in older individuals and the fact that

both of the collections have evidence for this condition in young adults reveal that the life of these individuals was not easy. The extent of some of these injuries in young adults would have been detrimental to their life, and leaving them with a loss of consequences and pains that would accompany them to battle.

The fact that two of these collections show the evidence for pre-existing conditions in young adults is a notoriously useful aspect for the further research of life history, since this truly reveals an aspect of their lives that would have affected them to the point were they had permanent damage done. In the same terms there could be more conditions that could reveal more about the life histories of individuals and how exactly did a person live through hard labour in the late medieval and early modern eras in North-western europe.

There is no secure way of knowing if these conditions are related to a military background, but one thing that can be known is that Schmorl's nodes are only developed after harsh and long labour, meaning that the individuals who live in both of these contexts would not have had an easy life. This is specially noted because of the nature of the siege in Alkmaar, there would be no strong training necessary for someone from a civilian background, due to the fact that the Spanish surrounded the city of Alkmaar from the outside. Both things do correlate with the historical context of both of these battles, and give more information on the context and lives of these individuals.

Healed trauma was also something that was studied in the process of this research. All of the ante mortem injuries that are seen in this study pinpoint not towards a life of struggle. One example of this is the case of Lützen, even though there was no study of pre-existing conditions, there was mention of cases of stress fractures on some of the individuals. These fractures were noted to be because of high levels of labour on the body, and as it was with the condition of Schmorl's nodes this is something that can tell a lot about the life of a person, since in order for someone to develop these conditions and chronic fractures they would have had to do hard labour for an extended period of time.

One last aspect of healed trauma that reveals information about the life history of individuals is the concept of defensive injuries, in all of the collection this concept has been used in order to study whether the individuals in the conflict had an opportunity to defend themselves. This can not only show a part of warfare, meaning how the fight played out, but it can also reveal more about the preparation that went on from before the fight. At the same time the appearance of what could be defensive injuries can also reveal more inr+fromation about the training methods of the battle itself. This is noticeable in the case of the battle in Uppsala, where it is noted that the peri-mortem injuries show no signs of defence, this correlates to the historical context since the swedish army was composed of farmers and people from rural populations.

6.1.3 Subquestion 3: Death

What kind of peri-mortem trauma can be observed and what does this reveal about the manner of death of the victims?

The peri-mortem trauma that is observed the most across all four collections is sharp force and projectile trauma. These are divided equally amongst two collections each. The graves from the battle of Good Friday in Uppsala and the battle of Towton show a majority of sharp force trauma which means that the fighting was done at close contact. Whereas the graves for the battle of Lützen and the Siege of Alkmaar show a majority percentage for projectile injuries, and as this has been mentioned before, these injuries can reveal more about the nature of the combat itself, based on projectile injuries the fight would be from a longer distance.

It is difficult to fully estimate the nature of death only from one type of trauma. The full extent of the evidence in each collection has to be looked at. For this study all of the collections show a sense of range amongst at least two of the types of trauma, which can reveal a lot about the nature of the conflict itself.

The results from the battle of Towton correlate with the historical context of the wars of the roses. The examples that are used in this research of the individuals in Towton show clearly the extent in which violence can come into play. The manner of death in which these individuals evidence death goes in line with what is seen from this battle, as it being one of the bloodiest battles in the history of England (Cole, 1973). The same happens with the battle of Uppsala, the extent of the injuries that these individuals show as well as the orientation of each of the blows clearly correlates to the aspect of the Swedish army as being composed of farmers. The evidence shows no defensive injuries and have a high prevalence for blows to the posterior part of the cranium, meaning that they were untrained against the danish mercenary squad. These peri-mortem injuries reveal that exact information, in which the manner of how they died is one of violence and lack of military skill.

In the examples of Alkmaar the larger mass grave shows stronger evidence of peri-mortem injuries than the small grave. However this may not be a confirming factor that the smaller garve was not part of the siege, seeing as civilians and women were also involved in the fight as it was an army mostly of rural population against the Spanish. In the case of Lützen the range of evidenced peri-mortem trauma can be used as an argument in the understanding of how long the battle was. As it is known as one of the longest in the Thirty Years war (Nicklisc et al., 2017). Every collection individually shows evidence for trauma, and these are comparable between each other.

Another aspect of the manner of death is the understanding of the ability of a person to be able to kill. As it has been said, the human being has to dehumanise the enemy for them to be able to attack and kill. This is something seen in examples such as the ones seen in Towton and the distribution of injuries seen in Lützen and Uppsala.

The use of peri-mortem injuries as has been done in this research can help further understand how people died in battle. To answer this question the data has been presented on what trauma could be observed, and what that trauma means to the extent of understanding the manner of death for population

6.2 Main question

What can we learn about the life history and death of the people who fought in different late medieval battles by studying their skeletons?

The soldiers who fought in Medieval and early modern Europe did not have an easy life. The context of being a soldier in all of the locations is marked by a destructive society, with a strong influence of violence. The distribution of occupational pathology can evidence the extent of labour that these individuals had to endure, at a very young age. In Germany, soldiers would have had extensive training, which resulted in healed injuries that correlate with the injuries that killed some of the individuals. In England the era of the Wars of the Roses proved to be violent, with some of the most destructive evidence for trauma. In Alkmaar, the distance combat did not prevent the soldiers from expressing extensive trauma, and the presence of females revealed more about the potential for their introduction into the battlefield. This can show the extent of life in the Netherlands, seeing as how this collection shows the most varied amount of sex estimation and age at death estimation results. Finally in Uppsala there is a tendency of violence as well, especially in cases such as the one from the decapitated man. There are a lot of injuries that support the argument of a lack of defensive strength from the Swedish army, which can also aid in the understanding of the historical context of this army being composed of rural populations. In all of these collections one aspect stays the same. The extent of violence that is shown in these injuries. Examples like the case studies of Towton 25 and the decapitated man in Uppsala, can show the true nature of violence in Medieval and early modern Europe.

The study of ante-mortem injuries has proved to be very valuable for the study of battlefields, although sometimes overlooked, ante-mortem injury can give clues to researchers about society context and the overall functioning of a society in a violent context. These types of injuries can be of great help, in combination they prove to reveal a much more complete story of the individual's life history, from the diseases and injuries they developed in training, up to their final moments alive. There is still research that need to be developed in order to fully understand how a soldier would have lived in european warfare society, but the comparison and combination of injuries and territories that this thesis has aimed to do, shows that there is a opening or learn more about life in battle if late medieval and early modern Europe.

The way in which pathologies are expressed in a younger individual versus in an older individual is quite distinct. When studying an older population joint diseases and joint degeneration can be visible. While if these same markers are seen in younger individuals it raises some flags about the life that they led. This is something that was observed in the process of this research, with the examples in Towton and Alkmaar. It is important to understand the harshness of the training and labour that individuals in the medieval era were subjected too. This is an important factor to note in this study, since it can reveal further more about a person and a society's lifestyle, the use of these aspects combined can help establish a base for the further study of life histories of individuals who live at war.

6.3 Suggestions for future research

This thesis has studied the use of peri-mortem and antemortem injuries in order to understand more about the life histories of people living in North-western Europe in the late medieval and early modern eras. Although this comparison between battlefields has helped highlight the importance of this study, this has also raised some questions that could be further studied in the future. These possibilities will be discussed in this section.

Schats explained that in the mass graves of Alkmaar a strontium analysis was used in order to determine the locality of the individuals (Schats et al., 2013). The use of these analyses may be of help for studies such as this and for future research, since the locality of people would be something important to consider especially when looking at battles that involve soldiers from different territories. It can also highlight the migration part of battle related history, in which travelling can affect a person's lifestyle and can also endure some stress onto the individual; either they moved because of the war, they moved to be closer to the fighting or they were soldiers from other territories who died in battle (Schats et al., 2013).

In order for the process of studying projectile injuries to be developed, some papers use CT scanning in order to study the projectiles that are found inside of the graves and lodged in the bones. This can become a useful tool in the study of life histories based on the study of projectile trauma, because the knowledge that can be gained from the calibre and the weapon that was used can help understand more how the fight played out, thus creating a more complete picture of how an individual died. Papers such as Leth (2007) and Lynnerup et al. (1997) use CT scanning for both archaeological and forensic purposes in order to analyse skeletal material in harsher environments. If this is amplified into the study of trauma and life histories, it could build a better base for the study itself to grow.

One last aspect that can be further expanded in order to develop the study of trauma and life histories of individuals in a context of violence is forensic and microscopic analysis. The replication of the weapon and force can aid in the understanding of the true nature of the act of violence. Thus explaining more the concept that has been discussed of dehumanising an individual. When the process of killing another human being is replicated, an understanding

of the extent of violence that was and still is possible in our society can be developed. These are all important aspects to consider, and if more is learned about the lives in the past it can be applied and used to learn more about our lives in the present and in the future.

7. Abstract

This thesis aims to study the use of analysis on skeletal remains in order to understand more about life histories of individuals from population in warfare during the late medieval and early modern eras. This research was done by comparing the data presented by four different literary sources. Each of them represents a collection from a specific battle and set. The sites that were used were the battle of Towton in 1461, England, the battle of Lützen in 1632 Germany, the battle of Good Friday in 1520 Uppsala, Sweden, and the Siege of Alkmaar in 1573, the Netherlands. The data on sex and age at death estimation, ante-mortem, peri-mortem and any existing stress related pathological condition was presented and later compared.

The analysis and comparison done to the data reveals a majority of young adult males in these populations, they all present ante-mortem and peri-mortem trauma that correlates to the historical context of the battle as well as presenting injuries that can evidence the extent of violence that was seen in this time period. The pre-existing stress related conditions revealed that Schmorl's nodes were the most substantial evidence and that it was predominantly seen in young adults.

The results that this thesis presented when compared, show a lot of similar information across all of these sites, when added together they reveal a full picture of the extent of life of these individuals. The evidence for pre-existing conditions in young adults points to a life of hard labour, and since this is something seen in two of the collections, comparison can be made and it can be interpreted that life in these two territories was not easy. At the same time a predominant majority of young adult males correlated to what is expected to find in medieval armies, however the evidence for females and young children can reveal a new perspective to the information, seeing as how warfare could affect not only those we were in direct involvement with the military. It was later shown that in comparison to each other, all of these collections can id in the creation of a basis for further studies in the area of life histories of individuals from the late medieval and early modern North-western Europe.

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8.2 Figures

8.3 Tables